Next Week: Datapro on Independent Peripherals

COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

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NEWSPAPER

Wide World Photos

Presidential hopeful John Anderson listens to Rev. Jesse Jackson before last week's Illinois primary.

Anderson Gets Confidence Vote From DP Efforts

By Marguerite Zientara
CW Staff

WASHINGTON, D.C. — As Rep. John Anderson's political fortune has changed him from a dark-horse candidate to a major contender for the Republican Presidential nomination, so has his monetary fortune increased dramatically in recent weeks — largely because of a computer-aided direct-mail fund-raising effort.

Craver, Matthews & Smith Co. — the same direct-mail consulting and management group that is running Sen. Edward Kennedy's fund-raising drive [CW, Feb. 18] — is managing Anderson's direct-mail campaign. The firm has raised $750,000 since its drive started in January, according to Rob Smith, its vice-president.

That figure is more than half the total $1,251,821 raised since the beginning of the year. It also represents almost double the $455,991 raised through conventional techniques in the period beginning last June — when Anderson declared his candidacy — through the end of 1979.

Clients Mostly Democrats

Most of Craver's political clients are Democrats "on the left side of the aisle," according to Tom Matthews, a partner in the firm. Anderson, however, is a logical Republican addition to this roster, having proven in last week's Illinois primary that he is capable of pulling in independent and Democratic votes — and, in fact, depends on them.

The firm's present effort for Ander-

(Continued on Page 6)

GTE Chairman Warns

Inflation Could Hinder Innovation

By Brad Schultz
CW Staff

MIAMI BEACH, Fla. — Runaway inflation may prevent vendors from delivering the new wave of communications products widely expected to revolutionize the way people work.

So said Theodore F. Brophy, who runs the nation's second largest communications supplier, at the Interface '80 conference here last week.

Although unofficial exhibitor estimates put total attendance at only a few thousand and an Interface '80 spokesman declined to provide any attendance figures at press time, exhibitors didn't seem disappointed with the turnout.

There were "fewer literature-gatherers" and more people who had buying authority, exhibitors agreed. When people stopped at booths to discuss products, they stayed awhile and indicated they were definitely shopping for their firms, several pointed out.

The low turnout was attributed to the nation's economic woes and the high cost of travel.

In his keynote address, Brophy, chairman of General Telephone & Electronics Corp. (GTE), said users should force those trying to win election to Congress this fall to adopt tough inflation-fighting measures. Otherwise, vendors may not deliver the network services and hardware that users eagerly anticipate in their long-range growth plans.

The reason is that double-digit inflation's erosion of research-and-development dollars leaves vendors pondering whether sales of the new

(Continued on Page 4)

No More Modems

By Brad Schultz
CW Staff

MIAMI BEACH, Fla. — There will be no need for modems in the all-digital networks of the not-too-distant future — and dime-sized hardware chips called codecs worth about a dollar apiece will convert voice and facsimile signals to digital signals that will be multiplexed with digital data streams,

The same communications facilities will handle both data and voice transmission as a new generation of switch controllers begins.

Sound too good to be true?

The limiting factor is phone companies, according to John Nuwer, Atlantic Richfield Co.'s corporate manager of telecommunications planning, who presented this scenario at Interface '80 here last week.

For digital networks to work effectively, phone companies will have to do extensive rehabilitation of their equipment resources, Nuwer observed.

(Continued on Page 6)

GAO Hits $17 Million Boondoggle

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — After $17 million and six years of work, a U.S. Department of Agriculture management information system is five years behind schedule and may never be completed as planned, according to congressional investigators.

Poor initial planning and inadequate project management are being blamed by Congress's General Accounting Office (GAO) for what may eventually be a $42 million DP boondoggle.

In a report prepared for Agriculture Department appropriations hearings this month in the House of Representatives, the GAO said the department's Farmers Home Administration (FMHA) still has not corrected the development problems of its proposed Unified Management Information System (Umis) — problems identified by GAO more than two years ago.

First planned in 1974, Umis was meant to keep track of FMHA's financial assistance programs for rural Americans. The agency last year reported an outstanding loan balance of $36 billion, representing aid to approximately 1.25 million U.S. farmers.

Based in a computer center in Kansas City, Kan., Umis was to have been an on-line management information system with a data base of between 1.25 million and 1.75 million records stored on 40 to 50 Honeywell, Inc. disk drives.

Employing some 1,000 applications programs and a specially designed control system, Umis was supposed to tie FMHA's field offices with the Kansas City center over telecommunications lines and offer daily record updates. The system was originally slated for full implementation by October 1978.

Poor Planning, Controls

According to GAO, however, the Umis project was ill-fated from the beginning. FMHA never fully determined its information requirements before designing the system, the report said. And because of poor management, the project is now years behind

(Continued on Page 8)

Back-End Data Base Machine Announced — But for OEMs

By Tom Henkel
CW Staff

LOS GATOS, Calif. — A back-end processor for data base management has been announced for OEMs by Britton-Lee, Inc.

The Intelligent Data Base Machine 500 (IDM 500) is a self-contained hardware/software system that includes a back-end processor and a relational data base management system (DBMS). The system does not use the host mainframe's resources but rather, like a communications front end, operates as a dedicated peripheral and offloads a specific host task.

The IDM 500 incorporates the same features found in most DBMS packages, but works about 10 times faster, Britton-Lee President David L. Britton said. It processes data at disk transfer rates — more than 800,000 byte/sec, he claimed.

"The access time to data depends on whether you're working out of memory or whether you're working on a disk," he added. "From disk, it averages the access time of the disk, which could be anywhere from 25 msec to 50 msec. That's the average time it takes the arm to move to retrieve something.

"If you're getting it from memory, then it's the speed of the memory,"

(Continued on Page 8)

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Education	J. Daniel Couger
Taylor Reports	Alan Taylor
Human Connection	Jack Stone

For Sales, Circulation and Production contacts, see inside back page.

Please address all correspondence to the appropriate department at 375 Cochituate Road, Rte. 30, Framingham, Mass. 01701. Phone: (617) 879-0700. Telex: 95-1153

OTHER EDITORIAL OFFICES:

West Coast: 407 California Avenue, Suite 10, Palo Alto, California 94306. Phone: (415) 328-8064.

Washington, D.C.: 821 National Press Building, 529 14th Street N.W., Washington, D.C. 20045. Phone: (202) 347-6718.

England: Steve Burton, IDG Publishing Ltd., 140-146 Camden Street, London NW1 9PF Phone: 01-267 1201. Telex: 851 264737.

W. Germany: Eckhard Utpadel, CW Publikationens, Friedrichstrasse 31, 8000 Munich 40, Phone: (089) 34-90-61. Telex: 5215350.

Asia: Hidetsuna Sasaki, Dempa/Computerworld Company, Dempa Building, 1-11-15, Higashi Gotanda 1-chome, Shinagawa-ku, Tokyo 141. Phone: (03) 445-6101. Telex: J2424461.

Australia: Alan Power, Computerworld Pty. Ltd., 37-43 Alexander Street, Crows Nest, NSW 2065. Phone: (02) 4395133, Telex: SECCO AA25468.

Brazil: Eric Hippeau, Data News, Computerworld do Brazil, Servicos e Publicacoes Ltda., Rua Alcindo Guanabara, 25/10th floor 20031 Rio de Janeiro, RJ Brazil. Phone: (021) 240-8225. Telex: 2130838(WORD BR).

Mexico: Kevin Kelleghan, Computerworld de Mexico, Oaxaca 21-2, Colonia Roma, Mexico City 7 D.F., Phone: (905) 514-4218, (905) 514-6309.

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For 8100 Applications

IBM Reduces Dependence on Cobol

By Tom Henkel
CW Staff

WHITE PLAINS, N.Y. — In a move it hopes will make applications development easier for less experienced programmers, IBM has released an applications program generator that reduces dependence on Cobol in 8100 systems.

Called the Development Management System/Distributed Processing Programming Executive (DMS/DPPX) Execution Facility, the program product is said to eliminate the need to convert English-like commands from the DMS/DPPX applications development tool to Cobol — or apparently any other high-level language.

DMS/DPPX was originally designed to take English-like commands from programmers and translate those commands into Cobol applications programs. Now Cobol has been replaced by the DMS/DPPX Execution Facility.

The DMS/DPPX Execution Facility "reads and interprets a compressed representation of DMS application source statements and performs desired functions using system code," according to IBM.

DMS/DPPX and another program product — DPPX/Cobol — were delayed by IBM last November. Although earlier CW stories suggested the entire DPPX operating system was delayed, IBM said that is not the case. An IBM spokesman declined to say if the elimination of Cobol as a base language in DMS/DPPX is related to problems with DPPX/Cobol.

Eight Functions

DMS/DPPX performs eight basic application development functions. It allows the user to define data structures and the characteristics associated with that data.

Users can define maps for use on CRT terminals or printers. Variable map fields can also be defined along with characteristics for each field, IBM said.

Applications that consist of groups of related processes can be defined, and processing statements can be used to define arithmetic, data movement, use of tables and access to map fields and data items. The user can also test and debug applications using DMS/-DPPX, IBM said.

Execution Facility

The DMS/DPPX Execution Facility is required to execute DMS/DPPX-developed applications. Those applications undergo a generation that produces a more efficient execution, according to IBM.

The Execution Facility will operate in a batch subenvironment under DPPX or interactively under IBM's Data Base and Transaction Management System (DTMS).

When operating under DPPX/-DTMS, an application can access DTMS or it can communicate with a host CPU's CICS/VS or IMS/VS applications, according to IBM.

The Execution Facility requires DPPX/Base and other optional IBM program products, depending on the operating environment. In a batch mode without mapping, no additional IBM software is required.

In an interactive mode with mapping, DPPX/DPS-FM — an option in DPPX/Base — is required along with DPPX/DTMS. For access to the host's applications and data, DPPX/Host Test Facility (DPPX/HTF) and DPPX/DTMS are required, IBM said.

DMS/DPPX can also be made compatible with a similar applications development product offered on the other operating system available on the 8100 line — DMS Distributed Processing Control Executive (DMS/DPCX).

IBM also offers a conversion aid product for users converting from Display Management System/3790, an IBM spokesman said.

Users' Reports

The changes in DMS/DPPX come on the heels of users' reports of problems with the DPPX/Cobol compiler. Some users with DPPX/Cobol installed in test sites point to file allocation problems, spacing problems and an insufficient error-reporting system in the language. Users also said DPPX/Cobol compiles slowly, executing about 2,500 to 3,000 statements per hour. [CW, March 3].

DMS/DPPX with the DMS/DPPX Execution Facility requires a minimum of 384K bytes of memory. DMS/-DPPX requires at least one CRT terminal with a 1,920-char. screen and 12 program function keys.

Software necessary for DMS/DPPX is DPPX/Base and DPPX Distributed Presentation Services. The Execution Facility requires at least one operator terminal and one CRT terminal — if maps are used, IBM said.

DMS/DPPX costs $93/mo for a basic license fee. The Execution Facility costs an extra $13/mo. For distributed systems, the DMS/DPPX license fee is $70/mo. per machine, and the Execution Facility costs an extra $10/mo. per machine, according to IBM.

DMS/DPPX will be available in June and the DMS/DPPX Execution Facility will be available in December, IBM said.

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MOSCOW

Will the world's best DOS sort go to the Olympics?

(Nyet! SyncSort DOS will hold its own games!)

Call (201) 568-9700

Be a "hostperson."

There's some good news and some bad news today.

The bad news is that no member of the SyncSort team will attend the summer Olympic Games in Moscow. Like most of the free world's great performers, we'll just have to boycott. (Or should we say personcott?)

The good news is that we'll sponsor our own "Free World Sorting Olympics." And we'd like you to volunteer to be a hostperson. Here's what you'll have to do if you happen to be a DOS/VS or DOS/VSE user:

First, pick up the telephone and call us. Quicker than you can say "Leonid Brezhnev," we'll dispatch SyncSort DOS to your shop.

When it arrives, we suggest you put it to work immediately. Match it against your present sort – or any sort program you have in mind – on the toughest and most grueling sorting events you can think of. Then whip out your stopwatch and check the results.

Finally, award the medals. We think you'll find that you'll be hanging at least three golds on SyncSort DOS:

- **Gold for Speed and Endurance.** Compared to any one of IBM's DOS sorts—the most likely challengers—SyncSort DOS gets there first with less huff-and-puff. Look for resource savings like this:
  - 20-40% in Elapsed Time;
  - 10-50% in Overhead CPU Time;
  - 15-30% in Total CPU Time;
  - 30-50% in Disk Space Utilization;
  - 10-40% in SIOs.
- **Gold for Hurdling Programmer Problems.** SyncSort is always "most popular" with applications programmers because it's loaded with features that reduce coding. Things like INCLUDE/OMIT, SUM, OUTREC, and a couple of slick new features that make copying from one file to another very, very easy.
- **Gold for Systems Sortsmanship.** SyncSort DOS never hassles non-sorts in the mix. One reason is Storage Auto Option—a new concept that manages your system's real storage in accordance with your overall priorities. Another is PARM-EXIT, which dynamically modifies your sort parameters.

After you've awarded the foregoing medals, lower the flag, put out the Olympic sorting flame, and say goodbye to all those sorting contestants from so many parts of the world.

All of them except SyncSort DOS. With the price of gold going up every day, hold on to it!

OVERSEAS REPRESENTATIVES—
Düsseldorf: SyncSort Technology GmbH,
Tel.: 0211-480351
Johannesburg: Computing Benefits Ltd., 46-2083
Melbourne: Shell Co. of Australia Ltd., (03) 8400311
Milan: SYNTAX, (39-2) 87. 74. 44
Paris: CAP/SOGETI Produits, 33-1-539-22-25
Reading (UK): SyncSort Technology Ltd.,
44-0734-481919
Stockholm: BRA, 46 8 88 03 00
Tel Aviv: ADVANCED TECHNOLOGY Ltd., 442697
Tokyo: Software Engineering Co., Ltd., (03) 446 1811
Utrecht: SyncSort Technology BV, 030-31-26-11

WHITLOW
COMPUTER SYSTEMS Inc. 560 Sylvan Ave., Englewood Cliffs, N.J. 07632

ASC Uses Three-Meter Dish Antennae

Satellite Service to Support Distributed Nets

By Phil Hirsch
CW Washington Bureau

MIAMI BEACH, Fla. — A satellite communications service for distributed networks operating at 19.2K to 40.8K bit/sec was announced here last week at Interface '80 by American Satellite Corp. (ASC).

Called Distributed Data Exchange, (DDX), the offering will utilize send/-receive dish antennae three meters (10 feet) in diameter — the first commercial application of dishes that small.

Gen. Harold Johnson (Ret.), ASC's marketing vice-president, said the Germantown, Md., company plans to tariff DDX "before the end of this summer." He declined to specify rates, but said they would "beat Bell's [Dataphone Digital Service] and Series 3000 charges at distances as short as 1,500 miles" for the user needing "three or four 9,600 bit/sec data streams."

Besides supporting distributed data networks, DDX was also designed for applications involving digital voice, digital facsimile, remote job entry, computer-to-computer communications and word processing applications.

Each 9,600 bit/sec channel can be configured to handle a different type of traffic, and an individual channel can be time-shared — to carry digital voice traffic part of the time and data at other times, for example. The service can also serve as a backup to a company's long distance telephone system.

One advantage of the three-meter antenna, Johnson said, is that it can be moved easily to avoid interference and/or accommodate changes in user requirements.

Electronic Mail Offerings

Johnson also announced plans for an intracompany electronic mail service dubbed EMX/SDX. It will utilize 9,600- or 56K bit/sec channels.

A 56K bit/sec digital facsimile terminal is now being developed by ASC, he reported.

For users that need to transmit 5,000 pages per day, EMX/SDX will cost approximately 10 cents per message, according to Johnson. For those with volumes of 1,000 pages per day, the projected cost per message is approximately 15 cents. In both cases, costs are based on transmission during nonbusiness hours.

CW at Interface '80

A limited intercompany electronic mail service is also under development at ASC. The company currently has 51 earth stations in place and plans to have 75 installed by the end of 1980, Johnson said. These will be used as distribution points for the offering.

ASC is also planning to interconnect with the Electronic Computer-Originated Mail (Ecom) service proposed by the U.S. Postal Service, assuming the regulatory problems over this offering are resolved.

Other Announcements

Besides DDX and electronic mail, ASC also announced:

- A Quick Response Communications (QRC) service designed to "ensure continuously available, high-flexibility communications services during or after civil or natural disasters." This service is based on the use of five-meter van-mounted antennae supporting voice, data and facsimile transmission up to 56K bit/sec.

A "standby version" of QRC utilizing three-meter dishes will provide similar service to a user's alternate data center when its main computer goes down and will provide backup in case his terrestrial network fails. The projected charge for standby QRC is $1,650/mo.

- An International Satellite Data Exchange (ISDX) service, complementing the present domestic offering. Texas Instruments, Inc. will be the first customer.

The message path will consist of domestic SDX channels interconnected at Communications Satellite Corp.'s Etam, W. Va., and Andover, Maine, earth stations, plus overseas satellite circuits leased from U.S. international record carriers.

Johnson added that Metropolitan Life Insurance Co. will use Manhattan Cable Co.'s coaxial cable local-loop system beginning next August to link its New York City terminals with ASC's domestic SDX system.

Dollar Erosion: Will It Halt Innovation?

(Continued from Page 1)

product generation will offset the rising costs of bringing those products to the user, Brophy explained.

For years, industry observers and participants have told users at conferences like Interface to expect exotic "supercontrollers," front-end processors, network architectures and satellite services as the DP and telecommunications industries merge with a vengeance during the 1980s.

Brophy did not say users should tear up their plans to assimilate this new wave. But he did indicate that inflation is becoming an important factor that, until recently, few prognosticators appreciated.

"Firms cannot afford to invest in extensive new communications and computer facilities when they are earning an inadequate rate of return from their basic business and are unable to recover the capital they have invested," the chairman noted.

GTE, for example will not recover half of the $2 billion it invested in R&D last year if inflation continues at the annual rate of 10% or more, Brophy pointed out. Recently, the inflation rate approached 18%.

Users should join with the vendors in pushing for reform of "obsolete" depreciation methods because data communications prices may soar as vendors struggle to recover their R&D investments with those mandatory methods, he indicated.

U.S. Position

Although inflation hurts all the major systems-producing nations to varying degrees, the U.S. may lose its position as the world leader in DP and telecommunications if other growth "barriers" continue to hamper domestic vendors, Brophy continued.

One barrier is systems incompatibilities, a condition that limits a user of one vendor's product line to communicating only with users of that line or of emulative equipment. "As corporations install multiple distributed systems," Brophy said, "it is essential to establish standards for communications among these systems, both within an organization and among organizations."

To gain "the maximum degree of flexibility to meet future growth requirements," users should select equipment that conforms to international standards. The CCITT's X.25 protocol standard for links between computers and public packet networks is "a model for our efforts in the future," Brophy maintained.

Counterproductive Acts

As an example of "counterproductive government actions," which Brophy called a second major barrier to a healthy data communications industry, the chairman blasted the U.S. Postal Service's board of governors for deciding late last month to retain control over the country's planned electronic mail services [CW, March 3].

By rejecting a Postal Rate Commission proposal to let private carriers offer competitive electronic mail services in conjunction with the Postal Service, the board dashed any hopes for "a large-scale post office/private enterprise partnership" in the near future, Brophy maintained.

The decision may "sharply curtail the role of competitive carriers in an electronic mail service" and could be "the first step toward reclassifying electronic messages as first class mail over which the [Postal Service] has a legislated monopoly," he charged.

"Considering the track record of the Postal Service with regular mail, this might well be the death knell of electronic mail — a service that has the potential of improving office productivity. Is this the government's solution to inflation?"

Turning to another aspect of communications regulation, Brophy said the Federal Communications Commission needs a formula for distinguishing between data communications and data processing lest it begin regulating the computer industry.

On the other hand, "it would be an illusion to believe that any formula could be effective for very long considering the rapid and unpredictable course of technology," he added.

A third obstacle to the communications revolution is this country's propensity for litigation. Finally, a fourth hindrance to this country's data communications community is subsidized foreign competition, Brophy said.

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15 WEST DE LA GUERRA • SANTA BARBARA, CA 93101 • (805) 963-1552

Corrections

The headline on Page 9 of the March 17 *Computerworld* should have been "Western Union Files Tariff for Voice/Data/Fax Service." AT&T is not involved in the service.

A story describing the expected characteristics of IBM's next generation of mainframes [CW, March 10] incorrectly reported that the firm's low-end H series machines are expected during the first quarter of 1980. The article was also in error when it said the announcement of IBM's "Whitney" disk system will probably coincide with the introduction of the first H series systems.

The story should have reported that the low-end H series CPUs are expected to make their debut during 1983 and that the Whitney disk unit will likely appear this quarter.

In the Feb. 25 CW Special Report, two test site users of Uppster Corp.'s 6510 printer were mistakenly identified as users of the Data General Corp. Nova 3 CPU. The Nova is used as a controller in Uppster's off-line Page Printing System.

Supreme Court to Hear Software Patent Cases

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — In what could lead to a landmark decision for the data processing industry, the U.S. Supreme Court has agreed to once again take up the subject of software patents.

The court decided last Monday to consider government arguments that the U.S. Court of Customs and Patent Appeals (CCPA) was incorrect in ruling that a Honeywell, Inc. firmware-based unit should be considered for a patent as a machine.

The CCPA ruling last summer overturned earlier decisions by the U.S. Patent and Trademark Office and its Board of Appeals that the device, a "switch system base mechanism" in Honeywell's Series 60 Level 64 product line, is actually software and not patentable under past Supreme Court decisions on software patents [CW, Aug. 20].

The device, submitted to the patent office in 1975 by Honeywell employees John J. Bradley and Benjamin S. Franklin, is a firmware module for manipulating system base information in both main memory and internal scratch-pad registers.

The patent office had ruled the function performed by the device could be performed by software and the fact that the function was in "apparatus" rather than "method" format did not make the invention any less related to an algorithm. As an algorithm, the patent office said, the invention was not patentable.

The CCPA, however, accepted Honeywell arguments that the invention is a machine and should be considered for a patent. The U.S. Solicitor General, acting for the patent office, appealed that decision to the Supreme Court, which said last week it will hear the case during its fall session.

Besides wishing to protect their invention, Honeywell officials insist the case has broad implications for the entire computer industry. A Supreme Court decision against the company "could be interpreted that any computer-based invention would not be patentable," according to one company executive.

The Honeywell official, who asked not to be identified because the matter is still before the courts, cited the increasing use of firmware in computer systems. He suggested the patent office is pursuing this case because "they have a lot of [computer-related] applications they would like to get rid of.

Indeed, the patent office noted in its Supreme Court brief in the case that more than 3,000 patent applications are pending "in which the patentability of computer software or firmware is a potential issue."

Approximately 1,200 of those cases involve mathematical algorithms and 1,800 nonmathematical algorithms, the patent office attorneys said. The office has been guided by the Supreme Court's 1978 decision in Parker vs. Flook, which "intimated that computer programs are not patentable under current law," the brief said.

"A definitive ruling to that effect would correctly leave to Congress the decision of whether and how to extend patent laws to computer programs and would greatly facilitate the administration of the patent system.

Associate Patent Office Solicitor Thomas E. Lynch said in a telephone interview last week that "what we're faced with is a kind of damned if we do and damned if we don't [situation]. We have two decisions by the Supreme Court [Parker vs. Flook and Gottschalk vs. Benson in 1972] saying computer programs are not patentable until Congress says otherwise, and CCPA says we're wrong and have misconstrued the Supreme Court.

"We are not trying to deny legitimate patentability to anybody," Lynch said. "We really have to find out what the answer is."

Reaffirmation Sought

The patent office would like the Supreme Court to reaffirm that software is not patentable, he said. In its Bradley decision, the CCPA limited the Flook guidelines to mean that only mathematical algorithms are not patentable, whereas the patent office has been refusing patents for all algorithms.

For the record, Honeywell emphasized its invention is hardware and only partly based on firmware. In fact, the company recently asked the Association of Data Processing Service Organizations not to file an amicus curiae brief with the Supreme Court on Honeywell's behalf because the association has been so closely involved in past litigation over software protection.

The company official said Honeywell is in no way defending its invention as software and believes, rather, that "90% of the software applications" now before the patent office probably should not be approved.

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AT&T Settles Datran Case For $50 Million

DALLAS — AT&T will pay $50 million to the bankrupt Data Transmission Co. (Datran), its parent Wyly Corp. and other parties in settlement of an antitrust suit filed four years ago.

The settlement was made without admission of liability by either party and is subject to the approval of bankruptcy courts.

Wyly filed suit against AT&T in 1976 charging the firm and its associated operating companies with possessing monopoly power in providing data transmission services in violation of the Sherman Antitrust Act and using this alleged monopoly power to impose predatory rates and practices to block competition.

The suit, which sought $285 million in damages, charged AT&T with keeping Datran out of the data transmission and digital data transmission services market.

Dream Dissolved

An all-digital communications network was Sam Wyly's dream. For eight years Wyly struggled, reorganized and sold parts of his Wyly Corp. empire just to keep afloat Datran, which pioneered the idea of an all-digital network.

Almost $100 million was pumped into Datran, largely from Wyly Corp. and from one other investor, Walter Haefer Holding AG of Zurich, Switzerland. But even at the height of its operation — just before Datran closed its doors — the digital data transmission network attracted just 150 users and was generating only $400,000 in billings each month.

Wyly gave up in August 1976, when he filed suit.

AT&T denied the lawsuit's allegations and responded by filing a counterclaim against Wyly, the Datran bankruptcy trustee and Careal Holding AG, Wyly's largest stockholder, claiming restraint of trade in the digital data transmission market.

Terms of Settlement

Under the terms of the settlement agreement, Wyly will receive approximately $25 million after payment of all attorneys' fees, litigation costs and payment of approximately $11.5 million to the Datran trustree. Additionally, all claims and counterclaims will be dismissed by all parties.

The Datran trustee, Stanley J. Samorajczyk, has indicated that the funds he expects to receive will be sufficient to pay in full all timely filed claims as allowed in the bankruptcy proceedings, other than the claims of Careal and Wyly, which will not be paid in full.

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Modem Replacement Seen

(Continued from Page 1)

Phone companies have tolerated noise and other line problems at levels that are usually adequate for voice traffic, but would be intolerable for data traffic.

Digitized voice may be sent with bit error rates as severe as one in a thousand bits without loss of intelligibility, he explained. But integrity that low in data communications would almost put an end to remote processing.

In contrast, errors may not appear more frequently than at roughly the rate of one in a billion bits if electronic funds transfer and other types of sensitive data communications are to proceed smoothly.

Although replacing conventional copper cabling in telephone lines with fiber-optic links would resolve some integrity problems, carriers still need to retard attenuation — loss of information over distance — before those links are fully digitized, Nuwer continued.

Development of the codec and perfection of fiber-optic technology is under way at a number of industrial laboratories, he added.

Controllers: Next Generation

Known by different names, including private automatic branch exchange (PABX) and computerized branch exchange (CBX), the forthcoming generation of controllers will form the juncture of at least three information flows: data, voice and word, Nuwer said.

Some controllers will be network-oriented. That type of multimedia integrator would offer capabilities valuable to the network as a whole — encryption, for example, which American Satellite Corp. offers with the intelligent controller it unveiled two months ago for support of data, word, voice, facsimile and video communications.

Other controllers will be oriented toward a particular building, according to a spokesman for a firm about to release such a machine. Some Bell-watchers predict that Antelope, Bell's entry in the so-called "supercontroller" sweepstakes, will even control room environments and energy consumption while it administers all communications media within a building [CW, Feb. 18].

The integration trend will open new opportunities for professional advancement, according to James H. Morgan, a Morristown, N.J.-based consultant.

In many organizations, he said, the position of information czar will go to whoever can learn three jobs — how to manage DP, how to manage telecommunications and how to manage an office.

Similarly, dominance in the nation's thriving "information sector," which by some accounts employs half the work force, will belong to the company able to supply DP and telecommunications departments and the office, which is essentially a word processing entity.

In a quest for this triple crown, IBM is expanding from DP into telecommunications and office equipment, AT&T is expanding from telecommunications into DP and office equipment and Xerox Corp. is expanding from office equipment into DP and telecommunications, Morgan observed.

Technological developments and the changing needs of businesses drive this tripartite trend, he indicated. Hence, Northern Telecom International and General Telephone & Electronics Corp. (GTE), with their roots in telecommunications, found they had to move into DP. This accounts for the formation of Northern Telecom Systems Corp. and GTE's purchase of Telenet Communications Corp., the consultant said.

From its position in the DP industry, Storage Technology Corp. is looking for a means of developing a PABX, Morgan claimed, which would make the firm a telecommunications/office supplier.

Other newcomers include Exxon Enterprises, with 14 affiliates in DP, and Citicorp, which now owns Axxa Corp., previously known as Lexar.

DP Increases Anderson Funds

(Continued from Page 1)

son goes way beyond advice, however, and relies on essentially the same direct-mail efforts as those used in the Kennedy fund-raising endeavor.

"It's the same process; we've started by renting and trading donor and subscription lists," the firm's vice-president said. "We've started in the traditional progressive issue and political candidate arena, and we're now moving to broaden that universe."

The group has already rented "50 or 60" mailing lists and is now "continuing beyond that," Smith said. He cited the number of individual letters sent out to date as "close to a million so far, with another half-million scheduled for this week" and an additional million planned to go out next week.

The first million letters that went out were one-time "Dear Friend" appeals aimed at those on the mailing lists of publications and organizations known to be "progressive and politically active," Smith explained.

Not all the fund-raising letters are one-shot appeals, however. Using the Anderson for President Committee's contributor file — stored by Carpenter Computer Co. in Rolling Meadows, Ill. — the Craver group can create a series of "personalized" letters that greet the recipient by name and cite previous amounts given.

"Chicago usually sends us a tape that we convert for any of the activities we're doing back here," Smith said. The donor list is updated "every few days" for address changes and "every couple of days" for additional donors.

In most cases the firm has found the personalized letters to be more effective than nonpersonalized ones as money-raising tools.

The fund-raising letters sent by the Craver group are designed to do more than just raise money, however. Letters may be aimed primarily either toward money-raising or toward political persuasion. If possible, the two objectives are combined in each letter.

The essential message is the same, however. In a six-page letter, Anderson talks of "a new form of politics that's growing — one made up of straight talking, common sense, courage and willingness to take stands on tough issues," Smith said.

Anderson garnered 35% of the Illinois primary vote — coming in second to Reagan's 48%.

Ban Lifted, But . . .

Carter Unveils Tough Rules on Sales to Soviets

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — The ban on U.S. technology sales to the Soviet Union is being lifted, but no export licenses for sophisticated American computer equipment will be approved in the forseeable future, according to trade guidelines unveiled by the Carter Administration last week.

Following the Russian military moves into Afghanistan, the Administration held up some 700 export license applications, approximately 400 of which had already been granted, for high-technology exports to the Soviet Union. While reconsideration of those 700 applications will begin immediately, "it's fair to say that a substantial number of these licenses will not be approved," an Administration spokesman said last week.

As the U.S. ends its current freeze on technology exports to the Soviet Union, it will impose much tighter controls on computer sales and new restrictions on software and other "process technology," government officials said.

The officials, who requested anonymity in briefing reporters last Tuesday, said it will be "a few days" before they can reveal more details on what the new criteria for export license approval. However, they confirmed what had generally been expected to be the outcome of the two-month-long export review.

The U.S. will ask for "very few" exceptions to the Coordinating Committee (Cocom) guidelines on the types of computers that can be sold to communist countries, the officials said. Any exceptions sought will be for "humanitarian reasons" or for items whose sales would be in the interest of the U.S.

Some exceptions to the trade freeze have already been made for humanitarian reasons, such as approval of spare parts exports for equipment operating in Russian medical facilities.

Tougher Criteria Sought

The Cocom organization, representing the U.S., Japan and the North American Treaty Organization countries minus Iceland, oversees a control list of technologies that cannot be sold to the Soviet Union, its Warsaw Pact allies and the People's Republic of China without the granting of a special exception.

Negotiations have been continuing in Cocom on new and supposedly more lenient export control criteria worked out last fall [CW, Feb. 25]. The Administration said the U.S. will ask that the proposals be amended to favor criteria roughly equal to the 1976 guidelines, currently in effect.

The 1976 guidelines restrict sales of computer mainframes with a "process data rate" greater than 32 million bit/sec. Because that criterion fluctuates with different system configurations and because CPUs can be and often are altered to meet the prevailing guidelines, it is difficult to specify what kinds of computer systems would be allowed under the new Carter scheme.

Generally, however, the guidelines would allow the sale to the Soviet Union of machines in the Control Data Corp. Cyber 171 class or below. Anything more powerful would require a Cocom exception, the type of exception now ruled out by the Administration.

> *Under the new Administration guidelines, applications for export licenses will be approved only for 'humanitarian reasons' or for items whose sale would be in the best interest of the U.S.*

In 1979 there were approximately 1,500 exceptions requested from Cocom, about 25% of which were for goods headed for the Soviet Union. The U.S. requested approximately half of those exceptions, according to government statistics.

The Administration officials said the decision to "drastically" reduce requests for exceptions represents a major change in export control. In addition, at least one new item will be proposed for addition to the control list, although the officials declined to identify it until the change is made official, probably by the end of the week.

The latest restrictions apply only to goods destined for the Soviet Union, the officials said, but emphasized there will be closer scrutiny of license applications for technology to other communist countries that might divert the goods to the Soviet Union.

Addressing the outlook for cooperation of U.S. allies in this plan — a major concern of U.S. exporters — the officials said they expect that foreign competitors of U.S. firms will not take advantage of the Carter plan and boost their sales to the Soviet Union. The officials acknowledged that U.S. allies have not given their wholehearted support to U.S. actions taken in the wake of the Afghanistan war, but suggested cooperation will be greater once the U.S. plan is presented in detail.

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GAO Hits $42 Million DP Boondoggle

(Continued from Page 1)

schedule and may eventually cost as much as $42 million to complete.

Once completed, GAO continued, operational costs of the system will be "exorbitant" and "the system may not meet the basic needs for which it is being developed."

An Agriculture Department task force has been established to conduct a detailed analysis of the project and decide whether to proceed or scrap the effort and start over with a new design alternative.

While GAO praised the task force effort, it noted that FMHA still has neither completed a requirements analysis nor adequately monitored changes in user needs during the last five years. "If FMHA selects an alternative to Umis without first conducting a requirements study," GAO said, "the selected alternative may also incur high risks."

The GAO report blamed most of the delays, cost increases and capability shortfalls of Umis on the failure of FMHA to assign a full-time project management team to assume technical and administrative responsibility for the project.

Also, no comprehensive system development plan was adopted, and "standard" DP project control measures — such as cost accounting and budget preparations — were not used, GAO added.

Furthermore, FMHA has been aware of the problems since 1977, the report noted. The Agriculture Department Inspector General's Office has continuously warned the agency of "serious technical problems with the system's design and about ineffective project management," according to GAO.

Symptomatic of the project's problems was that it was four months after Honeywell had been awarded a contract for Umis hardware before System Development Corp. (SDC), the Umis developer, was provided detailed information on the operating capabilities and limitations of the machinery contracted for.

By mid-1979, SDC reported it was not able to complete development of the system's Executive Control System and asked for an additional nine months to finish that phase of the software work. FMHA rejected that proposal and terminated the SDC contract.

Arthur Andersen & Co. was then called in to review the Umis project. The consulting firm found Umis to be a "high-risk technical project," questioned the ability of Umis to meet agency needs and "pointed out serious weaknesses with FMHA's management of the project," according to GAO.

Last November, the Agriculture Department withdrew its authorization for Umis development and set up the task force to investigate the problem, an effort just getting under way.

GAO recommended FMHA make a fresh start with a requirements analysis and identify various alternatives to Umis, such as upgrading the old FMHA system or relying on outside contractors for more of the agency's information needs. Above all, GAO said, the project needs a full-time management team employing stringent cost accounting systems and other applicable management techniques.

NCC Sets Fest On Personal DP

ANAHEIM, Calif. — A Personal Computer Festival will be held in conjunction with the National Computer Conference here May 19-May 22. The festival will feature a program of technical papers and commercial exhibits, along with live demonstrations of small computer equipment and systems.

Papers are still being sought on small computer systems, system applications and software, as are demonstrations of equipment.

Papers and inquiries should be directed to Robert Conti, Ibex Computer Corp., 18665 Oxnard St., Tarzana, Calif. 91356. Companies interested in participating can contact Dave Gordon, Programma International, 3400 Wilshire Blvd., Los Angeles, Calif. 90010.

OEMs Get Back-End Data Base Processor

(Continued from Page 1)

which varies according to the host mainframe.

"We do parallel processing and we do pipelining. In the data base processor we operate on the byte stream of the disk at disk speeds. Because a disk is very fast, when it comes to transferring data we move very rapidly. "This [also] saves us from having 16 individual channels to a disk drive," Britton said.

In addition to being faster, the IDM 500 is said to be easier to use than some DBMS packages. The system can use any high-level language as a base to Britton-Lee's query language, but Britton warned that some less common languages may be harder to interface with IDM's query language, the Intelligent Data Base Language (IDL).

Intel Corp.'s recently released Data Base Assist Processor [CW, March 17], which uses Intel's Fast 3805, a semiconductor replacement for IBM's 2305 fixed-head disk memory, may be faster in retrieving disk-stored memory, Britton admitted, but he claimed IDM 500 is faster as an all-around DBMS.

"The problem is being able to compile [some] high-level languages with our IDL or our interface specifications. It's not a modification [that is necessary], it's a subroutine sort of thing.

"If [the user wants] Cobol or Fortran, we've already done it. If it's a guy with Pascal or some other strange language, he must compile with our interface language — which is a high-level language in itself and the parameters are very similar to Cobol. It's not a major task at all; compilation is a couple days' work," Britton said.

Target Mainframes

Although IDM 500 will theoretically work with any CPU, Britton said the product is primarily aimed at Digital Equipment Corp., Data General Corp., Hewlett-Packard Co. and Tandem Computers, Inc. CPUs.

IDM 500 will also work with smaller IBM processors, such as the Series/1, but making it work on the vendor's larger CPUs — 360, 370, 4300 and 30 series mainframes — requires operating system changes, according to Britton.

In large systems, IDM 500 can be used as a centralized data base resource for multihost networks. On small systems, IDM 500 can be the basis of a small business system "with or without a front-end host," Britton-Lee said. A DBMS can be executed on a single intelligent terminal, according to the vendor.

Capacity of 32G Bytes

IDM 500 has a maximum data capacity of 32G bytes. A typical processing rate is 2- to 5 transaction/sec. That rate can reportedly be increased to 10- to 25 transaction/sec with a Data Base Accelerator Option.

Users can connect up to 50 DBMS packages to the IDM 500. It can handle up to 32,000 files per DBMS, the vendor said.

IDM 500 will accept a maximum of two billion records per file and a maximum 32,000 files per DBMS. Each file can have up to 250 fields, Britton-Lee said.

Basic Configuration

The basic configuration for the IDM 500 processor is one memory controller, a 256K-byte array board, Britton-Lee's SMD controller and a serial or parallel I/O option (the system can use either or both).

Options for the IDM 500 include the Data Base Accelerator, which is said to increase throughput by a factor of 10; additional memory in 128K- and 256K-byte array boards; serial I/O — eight lines on an RS-232C asynchronous interface with a 19.2 bit/sec maximum speed; parallel I/O — with a 250K-byte maximum; and additional SMD controllers.

Each controller supports four disk drives. Almost any disk drive is acceptable, Britton-Lee said.

IDM 500 is available only to OEMs. It ranges in price from $15,000 to $50,000 depending on the options and quantities ordered, the vendor said from Albright Way, Los Gatos, Calif. 95030.

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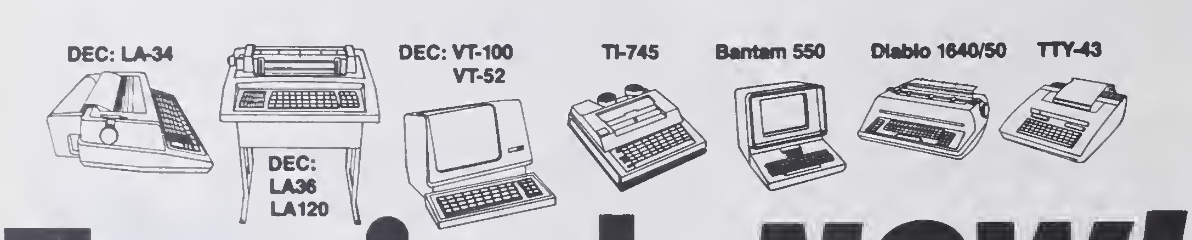

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Mini Makers — DEC Included — Hike Prices

By a CW Staff Writer

Citing increased labor and materials costs and rising finance charges, a number of minicomputer manufacturers have raised the prices on their small computer hardware and software products. The most surprising price shift came from Digital Equipment Corp.

The Maynard, Mass.-based mini maker announced two price hikes affecting packaged systems, hardware options and unbundled software as well as the maintenance fees charged for repairing older machinery.

Shortly after, Systems Engineerings Laboratories, Inc. (SEL), Datapoint Corp. and Harris Corp.'s Data Communications Division followed suit. More increases are expected.

Effective March 7, DEC's packaged systems cost 5% more and its hardware options 7% more. Unbundled software prices were raised by up to 15%. The increases covered all of the vendor's wares except its recently introduced Decnet Phase 3 software and LA34 and LA38 printers.

As of April 1, any service contracts written or renewed to cover the maintenance of older components — including some CPUs, terminals and peripherals — will be increased by 5% to 15%, depending on the makeup of the system. Other services, such as add-on installation, per-call time and materials charges and factory repair services, will be increased an average of 20%.

DEC's price hikes do not affect any orders placed by customers before March 7 or any orders subsequently received which were based on price quotes issued by the firm prior to the effective date, a company spokesman said. In addition, these increases applied only to DEC's U.S. customers.

About 98 pieces of older equipment still out in the field will be affected by DEC's second price boost. However, the spokesman noted that there is no serious shortage of available parts to repair the early machinery. In fact, DEC's Traditional Products Group is an arm of the company dedicated to supporting older products.

Other Vendors' Increases

Almost at the same time DEC announced its first price hike, SEL increased prices 6% for 11 of its System 32 series 32-bit minicomputer packages. SEL's boost, effective immediately, involves hardware only, a spokesman for the firm stated.

Jumping on the price hike bandwagon, Datapoint Corp. raised domestic purchase prices for hardware 3% to 8%, with an average rise of about 4%. The firm also raised lease product prices an average of 8% and increased maintenance charges.

Also noting rising electronics industry costs, Harris Corp.'s Data Communications Division raised lease prices for its distributed processing and terminal systems by a maximum of 8%. The price increases are effective June 1 and their degree depends upon the terms of the customer's lease.

Spurred by DEC's price boost initiative and the inflationary state of the industry, several other computer companies are seriously considering raising hardware and software charges. While a Data General Corp. spokesman explained that the company is "not anxious" to raise prices, he admitted that a general price hike is something the firm is seriously considering.

Representatives of both Prime Computer, Inc. and Hewlett-Packard Co. stated that although no price boosts are anticipated immediately, it is not something that will be entirely ruled out in the future.

AS/5000 Gets One-Year Lease

PALO ALTO, Calif. — As anticipated, National Advanced Systems (NAS) is offering a one-year operating lease for the AS/5000, an IBM plug-compatible system.

A unit of National Semiconductor Corp., NAS considers the one-year lease an aggressive marketing ploy to build a strong user base for the AS/5000, according to Robert Wilson, vice-president of marketing. This system "performs as much as 15% better" than an IBM 3031, NAS claimed.

In most cases, the 12-month lease is priced 30% lower than comparable terms for an IBM lease.

While many users are awaiting IBM's introduction of the H series of mainframes, they have an immediate need for more computing power, Wilson said. With its short-term lease, NAS is betting that users who now choose an AS/5000 will upgrade to the company's future models rather than switch to IBM.

"We will have the right machine for an upgrade and the more users that have our 5000 will take our next machine," Wilson declared.

Earlier this year, NAS offered operating leases with terms of 24 months to 60 months for its AS/5000.

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CW 3/24/80

Van Deerlin Condemns H.R. 6121 Opponents

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — Congressman Lionel Van Deerlin (D-Calif.), after trying for four years to rewrite the Communications Act of 1934, may be ready to give up.

This at least is one interpretation of the bitter attack he unleashed earlier this month against opponents of H.R. 6121, the current version of the "rewrite" bill.

In a speech to the U.S. Independent Telephone Association (Usita), Van Deerlin strongly implied that two of the bill's chief opponents — trade associations representing independent modem and telephone terminal manufacturers — are motivated primarily by their foreign, rather than their American members.

One target of Van Deerlin's wrath was the Independent Data Communications Manufacturers' Association (IDCMA) representing the modem makers. "Twenty percent of its members are foreign-owned," he said.

Manufacturers belonging to the other group — the North American Telephone Association (Nata) — consist "mainly" of Hitachi Ltd., Siemens AG, Ericcson and Nippon Electric Co.

According to Van Deerlin, "Nata's foreign members sold more than $32 billion worth of telecommunications equipment last year."

Harsh Words

The California Congressman also had some unkind words for Sen. Howard Metzenbaum (D-Ohio) who, in a recent speech, said that H.R. 6121, as now written, will enable AT&T to "literally wipe up the floor with its smaller competitorts."

Metzenbaum specifically criticized the bill for requiring AT&T to set up separate accounting records for some activities and separate subsidiaries for others [CW, March 10].

He contended that much stronger restrictions are needed to prevent the phone company from cross-subsidizing the new services that the bill authorizes it to offer — such as data processing — with revenues derived from existing monopoly services.

Referring to Metzenbaum as "that defender of small businessmen everywhere," Van Deerlin told Usita that "the Senator . . . wants to see Western Electric Co. lopped off from AT&T.

"I suspect this zealous proponent of antitrust measures soon will be introducing a new bill to break up K-Mart. Who knows, Seven-Eleven might be next.

"After that, the good senator might grab a plane for the Orient, where he can explain his concept of antitrust to members of the Japanese Diet."

Restricted Technology

Van Deerlin's main target was a proposed amendment to H.R. 6121 that would restrict the use of new technology developed by Western Electric and/or the Bell Telephone Laboratory.

The amendment would allow a particular innovation to be exploited either by Bell operating companies or the separated subsidiaries which H.R. 6121 authorizes, but not by both.

In other countries, by comparison, proprietary technology is routinely pooled within large companies, Van Deerlin pointed out. He contended that failure to let AT&T do likewise "may be fatally wounding an industry that will have to struggle for its very survival in a new world market."

Foreign Trade

U.S. foreign trade is already in serious trouble, Van Deerlin added.

"I am appalled . . . that our once favorable trade balance is now more than $29 million a year out of whack, and that this is probably the most significant single factor in a ruinous inflation."

While "oil is the main villain," it is not the only factor, he added. "We buy from Japan almost $9 billion a year more than Japan buys from us."

An important reason for the success of foreign firms in the U.S. market, Van Deerlin said, is that their governments encourage the pooling of technology.

Often these governments will "permit their own firms to pool proprietary information as a way of getting an especially large new customer."

World Market

Technological advances and regulatory action "have rendered obsolete the very concept of a strictly American [telecommunications] market," Van Deerlin told Usita.

"The new telecommunications industry will operate in a world market. The domestic market will be — is already, perhaps — a myth.

"If American telecommunications is to grow and flourish . . . we must recognize the wolves in sheeps' clothing — the IDCMAs and Natas of this world who invoke American traditions of full, free, fair commerce to undermine the vitality of American commerce.

"American firms must realize that their true rivals are not other Americans, but foreign competitors," Van Deerlin said.

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FIFTH INTERNATIONAL CONFERENCE ON PATTERN RECOGNITION, Miami Beach, Fla., Dec. 1-4.

Research papers are invited on all aspects of pattern recognition under the following topic areas: methodologies, preprocessing and feature extraction, applications and implementations.

Four copies of a draft for either a long (6,000-word) or short (3,000-word) paper should be submitted by April 1 to Professor Y.T. Chien, Department of Electrical Engineering and Computer Science, U-157, University of Connecticut, Storrs, Conn. 06268.

FIFTH INTERNATIONAL CONFERENCE ON SOFTWARE ENGINEERING, San Diego, March 8-12, 1981.

Papers are solicited in all areas of software engineering with particular interest in techniques and tools addressing problem definition, specification, development, certification and maintenance; case studies on cost/benefits; software productivity; management; impact of software engineering on the development of distributed systems; and the impact of the microcomputer revolution.

Five copies of each 2,000- to 6,000-word paper should be submitted by June 1 to Dr. Leon G. Stucki, Boeing Computer Services Co., P.O. Box 24346, Seattle, Wash. 98124.

SOCIETY FOR COMPUTER SIMULATION SPRING TECHNICAL MEETING, Fort Worth, Texas, April 17-18.

Simulation-related formal papers or presentations on topical areas relating to systems simulation and/or new applications of simulation are invited for consideration for presentation and for possible publication in *Simulation*, the Society for Computer Simulation journal.

Interested authors should contact Hugh Harris, ARB-2985, Arco Oil & Gas Company, P.O. Box 2819, Dallas, Texas 75221, as soon as possible.

1981 SUMMER COMPUTER SIMULATION CONFERENCE, Washington, D.C., July 21-23.

The conference theme is "Simulation: Foundations and the Future." Accepted papers will be published in bound proceedings distributed at the conference.

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Telenet to Unwrap Packet-Switched EMS

By Phil Hirsch

CW Washington Bureau

WASHINGTON, D.C. — Telemail II, the packet-switched electronic message system (EMS) that GTE Telenet Communications Corp. will formally unveil next week, will reportedly be economical enough to be cost-effective for firms with annual sales as low as $3 million.

A Telemail II tariff will be filed this spring, according to a knowledgeable source, and the service is expected to be operating by August.

Any terminal capable of receiving data over a telephone line directly or via acoustic coupler will be able to access the Telemail II network. TWX/Telex terminals also will be supported.

Service will be provided on an attended or non-attended basis. For users who cannot receive messages on-line, Telenet plans to deliver them via Western Union Mailgram. There will be a direct connection between the Telemail II network and the telegraph company's infomaster switch in Middletown, Va.

Telenet also plans to lease terminals as part of its offering. The Texas Instruments, Inc. 745 and Lear Siegler, Inc. ADM-3 will be among those offered.

Four Pricing Elements

Charges for Telemail II will reportedly be 40 cents to 60 cents for a message containing 1,000 to 1,500 characters. There will be four major cost elements in the pricing: local access and network usage, message storage, multiple addressing and on-line delivery.

Discounts are planned for customers that transmit during non-business hours and/or weekends. There will also be discounts for given message volumes; those discounts "will be competitive with those offered by Tymnet, Inc." the source said. Tymnet, Telenet's chief competitor, has just announced an EMS.

At its start, Telemail II network will service all of the U.S., including Alaska and Hawaii. It will initially be restricted to text messages, but planned enhancements beginning in 1981 will include facsimile and voice services.

If and when the present battle over the U.S. Postal Service's proposed Electronic Computer-Originated Mail is resolved in Washington, Telenet plans to connect directly with post offices in major cities. Messages destined for off-line customers could then be delivered directly to each destination post office instead of having to go through Western Union's Mailgram network.

Targeted Market

Telenet reportedly plans to market Telemail II to companies much smaller than those usually considered to be within the EMS market. According to the source, the "Typical" Telemail II customer will be a firm with "not many users," each of which now sends five to 10 long-distance messages per day by mail or telephone and receives 15 or 20.

Lower Cost

In its marketing campaign, the company is expected to stress that telephone use is far more expensive than Telemail II because of the high percentage of uncompleted calls.

Telenet reportedly believes there is a big market for Telemail II in companies with field sales personnel who must communicate frequently with their home bases. Internal communications among companies with multiple plant and/or locations represent another application.

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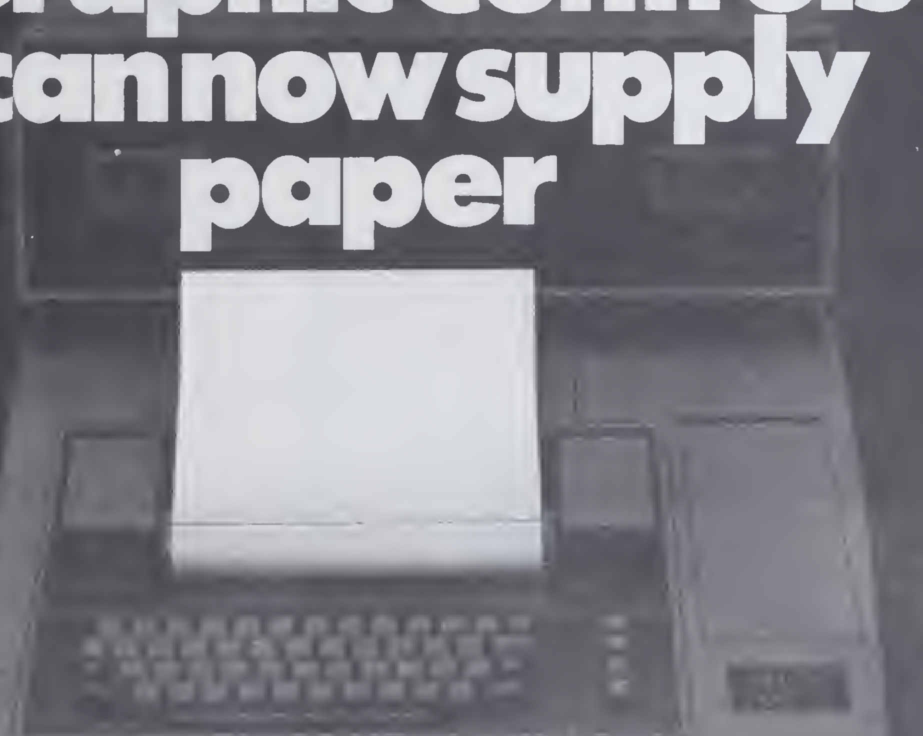

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See Page 7
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DP-Aided Polls Helping Politicos Aim Rhetoric

By Marguerite Zientara
CW Staff

CAMBRIDGE, Mass. — In the multimillion-dollar U.S. Presidential campaigns now under way, candidates are spending an estimated 5% of their budgets on computer-aided polling research to test the political waters before plunging ahead with various media campaigns.

Hoping to anticipate potential voters' every opinion, preference and intention so they can aim their rhetoric at the most receptive audiences, Presidential candidates rely on teams of political pollsters who use computers to process huge amounts of survey data collected from John Q. Public.

Pollsters can pinpoint — through surveys — the issues particular voters want to hear about, how voters feel about a candidate's stand on those issues and how a candidate should present his views in certain geographic areas, according to Robert Piro, vice-president and general manager of Cambridge Survey Research, Inc. (CSR).

Using basically the same methods, polling firms vary in sophistication according to the size of the company. About half have in-house computers and the other half use service bureaus, Piro said.

CSR — whose president, Patrick Caddell, was President Carter's pollster both in 1976 and again this year — is one of the more advanced polling firms. CSR upgraded its computer operations in 1978 from service bureaus to an in-house 512K-byte Prime Computer, Inc. Model 400.

CSR is a public opinion research firm rather than just a political polling group. However, it is well versed in the political realm, having started such research with the 1972 Presidential campaign of Sen. George McGovern. CSR currently has "about 30" political candidates, including senators, representatives and governors, Piro said.

When the candidate has determined how voters feel about the issues, about him and about his opponents, he can then plan a campaign strategy to emphasize his strengths and minimize his "weaknesses" in the eyes of the voters.

Through extensive telephone and in-person interviews — each lasting 20 to 30 minutes — researchers ascertain which types of voters strongly favor or oppose particular candidates, as well as which voters are undecided.

Typical Questionnaire

A typical questionnaire includes a series of "agree or disagree" statements to determine how voters feel about such subjects as the economy, national defense and foreign affairs. Interviewers also ask a series of questions designed to provide an objective view of the candidate's image and reputation.

Another area of questioning gives researchers an indication of the best way to reach selected voters through the media — interviewees are asked which newspapers and television news programs they see and find believable.

Because little can be done to influence people with strong convictions, pollsters try to determine the qualities for which the "undecideds" look in a candidate so a candidate can emphasize these qualities in an effort to sway votes.

A "sampler" — drawn up according to population and past voting patterns — determines whom the pollsters will interview person-to-person. "In a telephone-type interview, once we determine which towns will be polled, we then do a random-digit dialing," Piro said.

The telephone method, including as it does Democrats, Republicans and other political party members, would be appropriate for a general election, he noted. In a primary, however, interviewers would either concentrate on members of one party or ask interviewees to specify a party affiliation.

Sifting the Results

At CSR, after a survey is completed, the results are fed into the Prime 400 through 12 Lear Siegler, Inc. ADM-3 CRT terminals located here. Data can also be input through a Digital Equipment Corp. Decwriter system located in the firm's Washington, D.C., office.

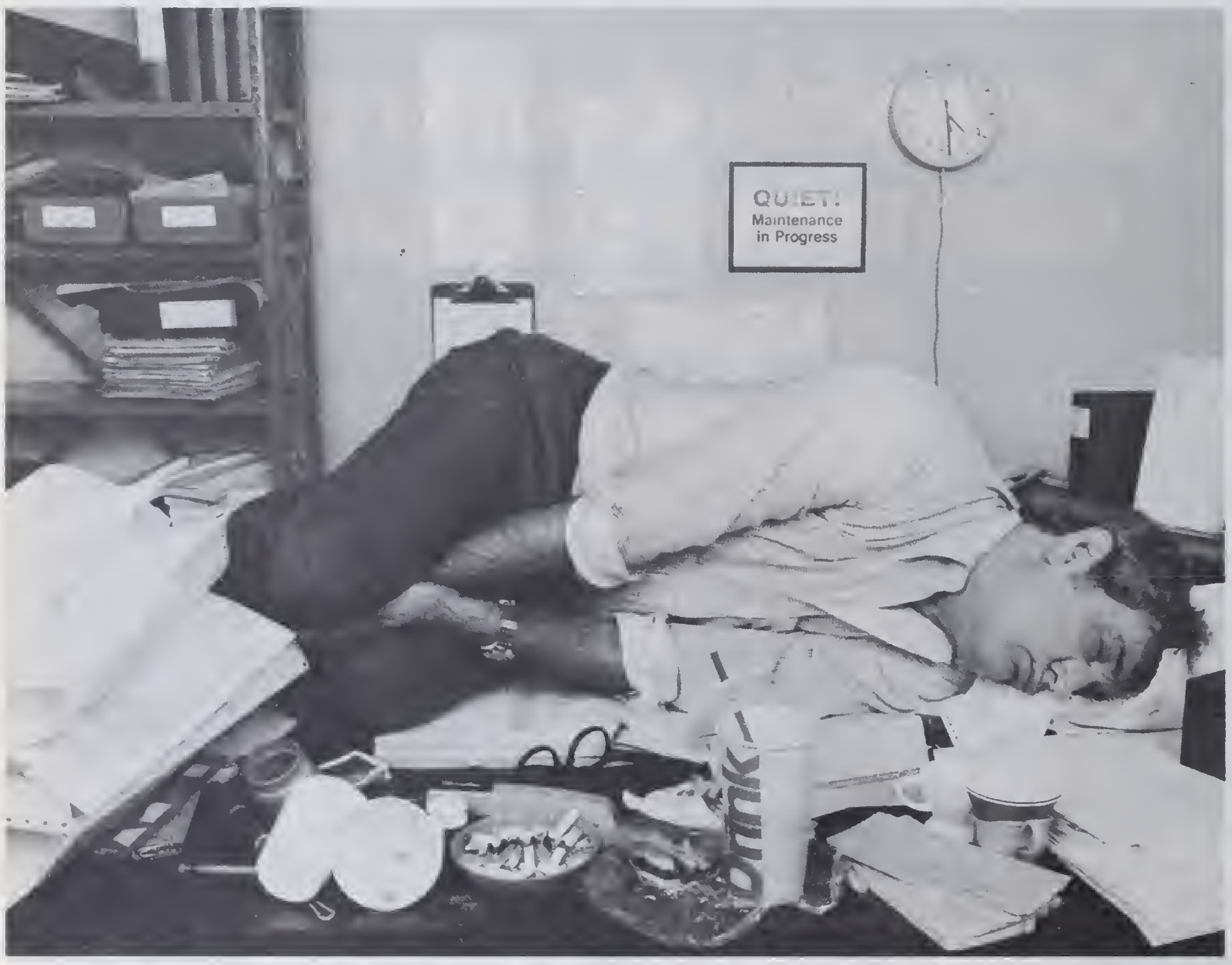
The data is put into manageable form using the standard Statistical Package for the Social Sciences (SPSS) from the National Opinion Research Center. Once the computer prints out the results, the group writes what is usually a 200-page report analyzing the questions and their answers in order to pinpoint general support, opposition and undecided voters.

Systems Compared

Before installing the Prime 400 a year and a half ago, "we used keypunch machines and then the programmer would do a batch run with the cards at a service bureau, using a large IBM machine," Piro recalled.

"This system is much more flexible in that respect," he noted. "We can do smaller runs, see their results and do cross-tabulations if we feel they are warranted, all in a much smaller period of time."

While turnaround time for the report used to be about one month, results are now almost instantaneous.



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Clustered Terminal System Also Bows

Tymnet's Packet-Switched EMS Leads Debuts

CW at Interface '80

By Brad Schultz
CW Staff

MIAMI BEACH, Fla. — An electronic message service (EMS) offering a direct link between data and facsimile terminals, a clustered terminal system priced at 25% less than its IBM counterpart and a 130 packet/sec communications processor highlighted the slate of products unveiled at Interface '80 here last week.

Tymnet, Inc. announced Ontyme II, an EMS that allows direct transmission of data from Ascii terminals to "virtually any" facsimile unit for hard-copy representation. Written in Pascal, the software service will be available through the Tymnet packet network starting June 1.

Ontyme II supports nearly all makes and models of Ascii terminals in any combination, Tymnet claimed, including IBM 3270-compatible devices, dial-in, dial-out and TWX units.

Ascii-to-Fax Translation

At the heart of Ontyme II is Compression Labs, Inc.'s Ascii-to-Facsimile Translator (AFT), which supports 4- to 6 min/page (CCITT Group 1) and 2- to 3 min/page (Group 2) facsimile units. AFT accepts messages coded in Ascii, Baudot, Ebcdic and other character sets that are prefaced by a message header containing the destination unit's telephone number, a Compression Labs spokesman said.

AFT automatically dials the receiver's telephone number, accepts Touch-Tone operator commands and then converts the message text to facsimile-compatible output, he explained. The translator also transmits partial and multiple-page documents automatically, preventing unnecessary telephone tie-ups, he added.

Terminals can communicate with an AFT module via an RS-232C interface at speeds up to 9,600 bit/sec. Ontyme II users can add a facsimile-to-facsimile message-switching capability to Ontyme II with Compression Labs' previously announced Facsimile Compressor (Fax-Comp), the spokesman noted.

By reducing the bandwidth needed to transfer messages, Fax-Comp can trim the cost of using Ontyme II.

As an adjunct to conventional DP, Ontyme II allows the user to route messages through a network without knowing whether receiver stations are terminals or facsimile devices, a Tymnet spokesman said.

Tymnet had not established a price for Ontyme II at press time, but said it expects to file a tariff with the Federal Communications Commission soon.

Terminals Emulate 3270

Interface attendees also saw Racal-Milgo, Inc. unwrap its Model 4270 clustered terminal system series, which emulates IBM's 3270 line of CRT terminals. The series includes a 4274 system controller, 4278 CRT terminal and two printer models.

Under IBM's Bisynchronous Communications, Synchronous Data Link Control or Systems Network Architecture protocols, the 4274 and 4278 match the functions available with IBM's 3274 control unit and 3278-2 CRT terminal, respectively, but cost about 25% less, a Racal-Milgo spokesman claimed.

The 4270 series runs in the 2,000- to 9,600 bit/sec range. Each 4274 drives control functions through a 16-bit microprocessor and I/O functions through additional 8-bit micros; the controller supports up to 32 CRT terminals and printers.

With a swivel monitor, the 4278 CRT terminal displays 24 80-char. rows on a 15-in. screen. Users can place the 4278, a 160 char./sec serial printer and a 200 line/min printer up to 5,000 feet from the controlling 4274, the spokesman stated.

A 4274 with four 4278s and the serial printer costs $27,190 or leases for one, two and five years for $696/mo, $560/mo. and $488/mo, respectively.

Packet-switch communications processors were unveiled at Interface '80 by BBN Computer Corp. (see story on Page 35). The processors handle 130 packet/sec.

Among other products introduced at Interface '80, Univac's Minicomputer Operations gave each member of its V77-600 and V77-800 processor series links to its Distributed Communications Architecture (DCA). For $3,000, users can now run multiple lines from DCA to each processor.

The same enhancement gives compatibility with Datapac and other public data networks, the vendor noted.

Univac also presented the Global Resource Access Module (Gram), a software interface to DCA that reportedly allows applications to be developed independent of communications protocols. Gram costs $1,000.

A third product from the Blue Bell, Pa.-based vendor, the Model 1004 LPH module, allows the non-DCA user to implement remote batch tasks between a V77-600 or 800 and Univac's 90 or 1100 systems. It costs $3,000.

Another introduction at the conference was NCR Corp.'s Tran-Quest software, which the vendor said will allow non-DP personnel to use computer-stored data bases. Incorporating a data dictionary, data manager and query processor, Tran-Quest runs with NCR's version of Cincom Systems, Inc.'s Total data base management system and with the firm's V-8000 computer systems.

The data dictionary defines and documents all elements of the user's host system including hardware and operating systems.

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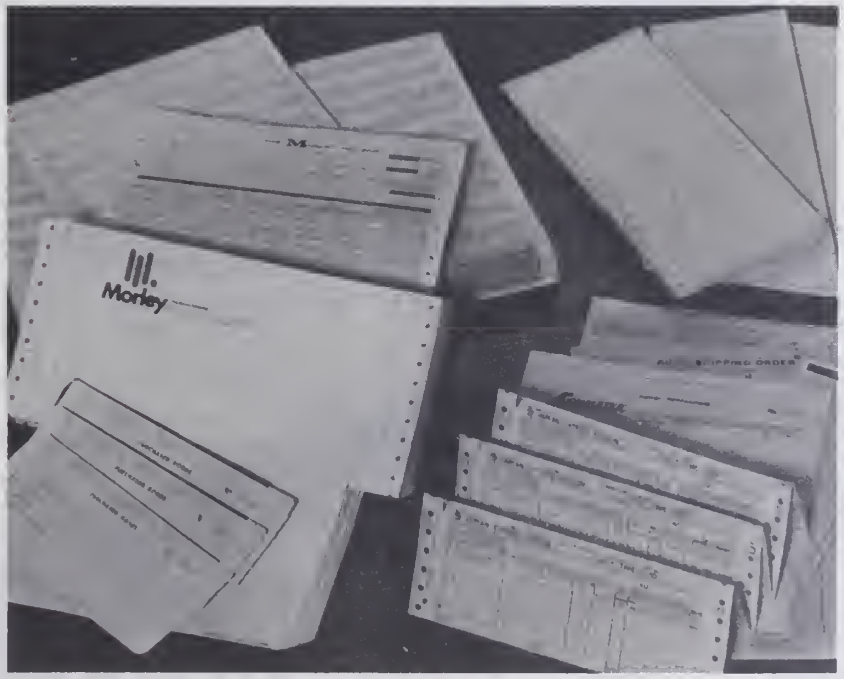

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Army Approves Instruction Set Architecture

By Marcy Rosenberg
CW Staff

FORT MONMOUTH, N.J. — The U.S. Army Communications Research and Development Command (Coradcom) has approved an instruction set architecture for its family of standard battlefield computers.

Called Nebula, the design was developed under contract by Carnegie-Mellon University in Pittsburgh and tailored to execute programs written in Ada, the Department of Defense programming language [CW, Nov. 19].

Indicating that no other designs were evaluated, Frank Ward, a Coradcom electronics engineer, said the Carnegie-Mellon design was "the only one available to us that is fully government-owned."

Because it is owned by the government, the Nebula instruction set architecture can be used by industry vendors in competitive contracts for both military and commercial applications without fear of violating patents, Ward commented. He knows of no plans for commercial use at present.

Not a Compiler

Distinguishing Nebula from a compiler, Ward said the instruction set architecture is a design framework for the computer which contains assembly language instructions, the registers available to the programmer, procedure calling mechanisms and memory organization.

With 32-bit addressing, Nebula provides the largest potential memory capacity offered in a military instruction set architecture — more than 4.6 billion bytes, according to Ward.

A primary objective in designing Nebula was to be able to efficiently write programs in Ada. Ada's case statement, procedure calling and tasking, for example, were written in assembly language in Nebula so that they "should" compile directly from assembly language into Ada, he explained.

Nebula differs from many conventional architectures in that it does not imply a specific implementation technology or hardware design.

Its operand access, procedure invocation, supervisor call and illegal opcode mechanisms provide an integrated structure which "obliterates the distinctions between software, microcode and firmware that are present in conventional architectures," Coradcom claimed. This means that Nebula programs can automatically be configured to execute on various hardware of different cost, performance and ability.

Ward said the Nebula instruction set architecture does not include a specific hardware technology or integrated circuit logic, so Nebula hardware can be built using TTL, bipolar or other logic circuits to run at different speeds.

First in 15 Years

According to Coradcom, Nebula is the first new 32-bit military instruction set architecture developed in 15 years. The architecture differs from its predecessor, Litton Industries' AN/-GYK 12, in that it offers more powerful instructions, Ward said. The Nebula call instruction, for example, can write subroutines, or procedures, that have a variable number of parameters.

The Army is the only military branch so far to approve Nebula. Approvals by the Navy and Air Force, however, are not necessary for further Army developments.

Now that the Army has approved an instruction set architecture, Coradcom will hold a seminar here March 25 to acquaint other military branches and hardware and software vendors with Nebula and to solicit industry comments and recommendations for improving the design. After a design is finalized, Coradcom plans to draw up a request for proposals for hardware and put it out for bids, probably by the summer.

Plans are to award four development contracts and, after benchmarks and environmental and operational testing, award one five-year requirements contract. Concurrent with the five-year contract award, Coradcom will repeat the process and award four more development contracts "so we don't get pinned down to one set of hardware," Ward remarked.

MIT Center Sets Update Course

CAMBRIDGE, Mass. — A course on "Current Issues in Information Systems" will be held June 16-20 by the Center for Information Systems Research of MIT's Alfred P. Sloan School of Management.

The course will offer an update on progress in many of the basic and applied research areas covered in previous versions of the course.

More information on the session, which costs $1,050, is available from the center at Alfred P. Sloan School of Management, MIT, 50 Memorial Drive, Cambridge, Mass. 02139.

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Basic Obstacle Yet to Be Overcome

Glaser Says Voice Recognition Still in Infancy

By Jake Kirchner
CW Washington Bureau

ATLANTA — Voice recognition devices will soon be as standard to data and word processing systems as keyboards are today, according to some industry observers — but only if 20 years from now can be considered "soon."

Although there are already numerous commercial applications of voice recognition technology, it will be years before one can talk to a typewriter and have it understand what is said, let alone what is meant, according to George Glaser, president of Centrigram Corp.

Addressing a technical session of the recent Office Automation Conference here, Glaser warned prospective buyers that many obstacles remain before voice recognition devices can be introduced into normal office environments.

The basic problem is not new: It still takes enormous computing power for a machine to differentiate between the various linguistic variables attributable to age, sex, accent and emotional and physical condition. As one speaker at the session noted, further advances in the technology will come not through increased knowledge of language, but through faster and cheaper computers.

'Nonsense' Claims

There are some devices even now with "universal speech" recognition capabilities, but they could be suited to commercial applications only with "some fairly severe limitations," Glaser said.

The inexpensive devices on the market today have limited vocabulary, especially those that manufacturers claim are "speaker-independent," or able to respond to anyone. There is "a lot of brochuremanship being engaged in by vendors here," Glaser remarked.

Claims of 900- to 1,000-word vocabulary devices with 99% and higher reliability rates are "generally nonsense," he said. An additional problem is that there are no standards in the business by which to compare the various offerings. Prospective users can only "take them home and try them out."

Limited Application

Glaser cautioned that even in the future, applications for voice recognition devices will be limited.

"There are not many people who talk seriously of computers using voice recognition to replace thousands of keystroke entries," he said.

Human speech is just too slow. "For raw speed, a trained keypuncher will wipe out a voice recognition system," according to Glaser.

Cure for 'Keyboard Phobia'

Turning to the good news, Glaser listed several very realistic applications for near-future voice recognition devices. The technology will be attractive because to a certain extent it will accommodate natural communications, he explained, offering a cure to "keyboard phobia — the kind of disease known to affect doctors and lawyers" and others who still do not make full use of the computer technology available to them.

Voice recognition will be a data entry boon to those who must keep their hands and eyes free or be mobile, such as workers on a loading dock, a common site for voice recognition devices now in use.

Consumer Data

The technology will also be particularly useful for answering telephones and receiving data over the phone from consumers, most of whom will not have data entry devices such as Touch-Tone telephones, Glaser said.

In short, before long every intelligent terminal and word processing system will have some voice recognition capability, Glaser predicted.

The technology will also spread to the home fairly quickly, leading to the kind of applications that usually are considered rather far-fetched — the bark-activated door for the family pet, for example.

Machines with vocabularies of a few hundred words are possible now, Glaser said. Those machines use "branching" techniques; if the device is to recognize a word or a color, it must first be told it is about to hear a word or a color.

Sophistication in the Lab

Anything more sophisticated takes a lot of computer power, Glaser said, although there are some "truly impressive machines" now in the laboratories, as Lalit Bahl of IBM's T.J. Watson Research Center in Yorktown Heights, N.Y., attested.

Manager of a voice recognition research project, Bahl told the conference session that within five to 10 years a laboratory device could be built suitable for business dictation devices.

The device would need a vocabulary of about 3,000 words, he said, and theoretically would be no real problem to design. He declined to predict, however, when such a machine could be available commercially.

"We have a lot of work to do," he said.

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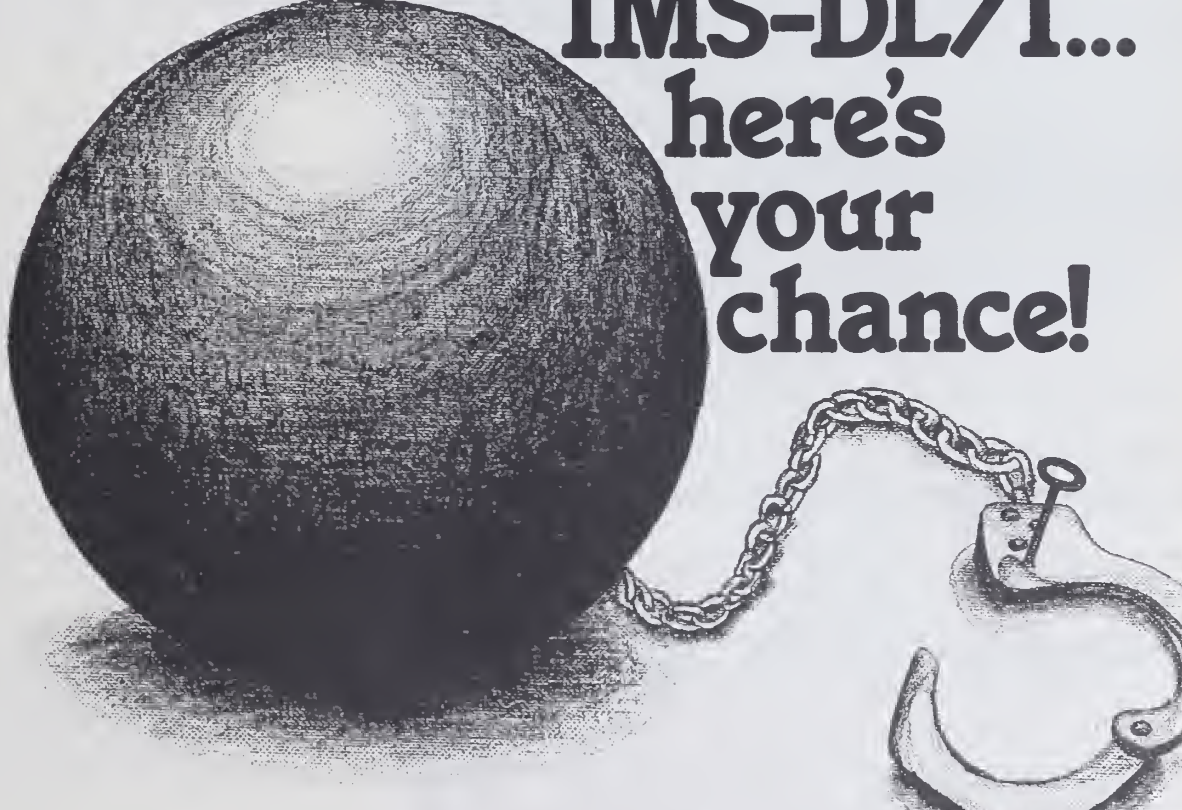

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Cary's Testimony Added to U.S. vs. IBM Record

By Connie Winkler
CW Staff

NEW YORK — Not one of the controversial "Cary subpoena" documents was produced, but IBM Chairman Frank T. Cary's testimony is in the U.S. vs. IBM antitrust trial record.

As a result of a compromise, Cary's testimony in other trials was inserted in the record in lieu of Cary's actually taking the stand. In return, the Justice Department dropped its broad February 1979 subpoena for post-1974 documents related to Cary's testimony.

"It is important to note that despite IBM's claim that it would take 62,000 man-years to comply with that subpoena, not one piece of paper was produced . . . as a result of our agreement," Justice lawyer Joseph J. Tabacco Jr. said. "The compromise bodes well for the rest of the trial."

The compromise would not have been possible, IBM counsel Richard L. Hoffman noted, if the government had not agreed to limit Cary's testimony to pre-1974, which was "necessary to avoid the burdens of the so-called Cary subpoena," Hoffman told the court in presenting the written Cary testimony March 11.

On March 15, 1979, IBM moved to quash that subpoena charging it called for every DP related document in the corporation and would require 62,000 man-years of searching at a cost of $5 million.

On June 25, 1979 Judge David N. Edelstein ordered IBM to comply with the subpoena, and then negotiations began to use Cary's prior testimony.

Privileged Documents

Although Cary's testimony was primarily previous testimony and exhibits, several documents on which IBM had claimed attorney-client privilege were introduced by the government.

One, which Hoffman argued was irrelevant to the issues of the lawsuit, was Cary's writing to past IBM chairmen Thomas J. Watson Jr., T. Vincent Learson and Albert L. Williams to inform them it would take 30 to 60 days of preparation for this trial.

"Whereas the deposition was the government's effort to discover information and a defendant witness is under no obligation to refresh his recollection for the government's benefit, testifying affirmatively for IBM will require a very thorough familiarity with all of the facts," Cary wrote in January 1975, five months before the trial began.

Another heretofore confidential memorandum to Cary, from an IBM lawyer called the "3 x 3" price change in 1966" admittedly a facade.

"We are trying to avoid the appearance of a price increase," H. Bartow Farr Jr. wrote. Subsequently IBM dropped CPU rents 3% and increased purchase prices 3%. The government argued this was to counteract leasing company inroads.

The excerpted portions of Cary's testimony, which filled 700 transcript pages, are from Telex Corp., Memorex Corp. and Transamerica Corp. actions against IBM and from his deposition testimony in Memorex, Forro Precision, Inc. and Greyhound Computer Corp. actions, as well as his 1974 and 1979 depositions in U.S. vs. IBM.

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Rerun of 'IBM 360 Story' Aired in Antitrust Suit

By Connie Winkler
CW Staff

NEW YORK — "The IBM 360 Story" might as well be an old movie, as many times as it has been aired in the U.S. vs. IBM antitrust trial. The IBM witness who brought back the most recent rerun was Bob O. Evans, now IBM corporate vice-president for engineering, programming and technology, but in the early 1960s the "person responsible on a worldwide basis for development of 360."

Evans, whose direct testimony was entirely excerpted from his prior testimony in Transamerica Corp. vs. IBM, was IBM's 30th witness and apparently its last "fact" witness to actually take the stand. IBM still has as many as four economists to call in its defense.

Much of Evans' one day on the stand focused on IBM's 360 plans prior to its announcement April 7, 1964. The Justice Department has charged IBM announced the 360 prematurely to cut off competition, particularly the Honeywell, Inc. 2000.

Group Plan

Evans said in September 1963 he first advised IBM senior management that the New Product Line (NPL) was ready and that five processors should be announced as a group. In March 1964 he again advised that 360 production schedules could be met.

On direct examination, Evans also testified:

- How important a new, standardized architecture was for the 360, making models compatible.
- There were "lots of armchair admirals" who predicted worse hardware and software problems than actually occurred.
- The enormous complexity of the operating system caused IBM to miss some production schedules.
- IBM took a risk in announcing the 360. *Fortune* magazine called the decision "you bet your company," attributing the statement to Evans. "They didn't hear it from me, but it was attributed to me," Evans said.

Staggered Plan

However, Justice Department lawyer Mark W. Gaffney introduced documents suggesting there was no lump 360 plan. Various meeting minutes showed there was a staggered announcement plan for 360 models and that several would not be ready until 1965.

On redirect examination, Evans countered that there were many products planned for announcement in 1964-1967 and that a specific presentation to the Corporate Management Committee was on peripheral products such as optical character recognition devices.

Gaffney also introduced two Evans' memoranda from December 1963 and July 1964 where he complained "IBM still has no NPL plan." The IBM executive responded that there was no agreement across all the sectors on the "precise plan" for 360 introduction. Alternative opinions kept cropping up and not everyone was marching to the same drumbeat, he added.

Evans Move

In December 1964 Evans was moved from overseeing the 360 development to president of the Federal Systems Division (FSD), a move he called a "spanking" or "punishment."

On questioning by IBM, lawyer Robert F. Mullen said others considered the job a promotion and at FSD he was closely involved with National Aeronautics and Space Administration space flights.

One of the reasons for Evans' move out of the 360 development mainstream, the government suggested, was a 1964 review of IBM products showing seven out of 10 were rated equal or inferior to competitors' systems. Evans agreed this was a "revealing" report.

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To Transmit Academic Records

DP Link to Aid Puerto Rican School Children

NEW YORK — A recently developed satellite communications system between New York City and San Juan, Puerto Rico, will soon facilitate the education of thousands of Puerto Rican school children who are forced to follow the paths of their migrant parents between New York and Puerto Rico.

The Metropolitan Education Laboratory (Metrolab) system, expected to be operational by the end of the month, will upgrade the computer link presently in operation, which works only to notify the other end of the names, addresses, birth dates and destinations of students in transit. That information is kept on a 110-char. record and updated monthly based on data transmitted from schools.

What is not currently relayed via computer are students' academic records, including all-important test scores. This information, which is transferred back and forth on postcards, frequently is lost between the time it reaches the terminal link in San Juan and the time it actually arrives in the hands of the students' new principal, who is charged with maintaining those records.

When academic records and test scores are lost, students usually find themselves in a state of educational limbo while they wait for their records to catch up with them. Approximately 18,000 students travel back and forth between New York and San Juan yearly.

Dr. Richard P. Vigilante, Metrolab administrator, is using a hardware configuration anchored by a Digital Equipment Corp. PDP-11/70 with 512K bytes of memory running under the RSTS-E operating system. Linked to the 11/70 are three DEC drives: two with 88M bytes of storage and one with 176M bytes.

The Department of Public Instruction in Puerto Rico is currently operating an IBM 370/138. Metrolab has an IBM 4341 on order, and San Juan is also in the process of upgrading by expanding its disk storage capability to include achievement test information.

'Preslugged' IDS

According to Vigilante, the system about to be initiated is the brainchild of his colleague, Mel Kizel. The new system "preslugs" the students' ID and its attendant information on an optical scanning form when they take a test.

This information can then be transferred to tape and sent via satellite or facsimile copy back and forth across the 1,600-mile gap.

Another aspect of the satellite link, Vigilante said, is the teleconference line. This capability will also direct audio and visual contact between groups at either end.

In New York, conferees will gather at the Center for Nonbroadcast Television in Manhattan, where their images will be transferred by cable to the satellite dish in New Jersey and beamed to San Juan. They will then appear on a large screen monitor at a Public Broadcasting System station at the University of San Juan.

"We can also use the link for data or facsimile transmission," Vigilante noted.

DPMA Planning Curricula To Fill Professional 'Gap'

By Bruce Hoard
CW Staff

The Education Foundation of the Data Processing Management Association (DPMA) is moving into the area of university and college curriculum planning in an effort to fill what it regards as a "great gap."

The foundation was established by DPMA in 1975 to expand educational opportunities for information systems professionals and conduct research programs of benefit to the DP industry, educators, business, government and the public.

For the past eight months, it has been working on a model curriculum that will address the educational needs of business data processing, an area that Education Foundation President Donald E. Price feels has not received sufficient attention.

"The Association of Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE) have developed curricula for many years for colleges and universities, but primarily in computer science," he said.

Price said that he thought ACM was and is "strong" in computer science, but added that computer science alone can not serve all the needs of information systems professionals and that many college graduates are not effective in an applications environment.

'Top Down' Training

Price, who is president of the foundation's five-person board of regents, said that the use of structured methodology or "top down" training is integral to the new DP business model curriculum. He called structured methodology "a manner of designing systems" which "breaks large problems into small modules."

In order to ensure that future instructors are able to convey the contents of the model curriculum in the manner intended, the foundation is holding a two-week institute at the University of California at Berkeley from July 7-18.

Price said that he expected approximately 80 teachers of computer systems to attend the institute, which will consist of 40 hours of lectures and 40 hours of labs. Participants will receive five units of academic credit.

Exclusively funded by DPMA in the past, the foundation is now reaching out to other financial sources as it develops future programs. It recently developed a new system for fund raising based on a marketing strategy. "I feel pretty good about future funding," Price commented.

Future Projects

Future foundation projects include the development of 50 two-day workshops designed to cover software areas such as managing software projects and estimating software costs. An educational organization known as State of the Art Seminars will cosponsor the workshops, which will be held in the U.S. and several foreign countries.

The foundation has also been working with the Institute for Management Improvement for a year on a series of four-hour workshops in the area of management training. The Institute for Management Improvement is part of the American Council on Education, which will provide instructors for the workshops.

Also planned is a self-assessment program for DP managers. It would give them the tools, probably in the form of a multipage questionnaire, to assess their shortcomings and direct improvement in those areas. Price said that the project is dependent on one grant of approximately $35,000 for design work and another of about $60,000 for implementation.

The foundation is also currently conducting survey work on the creation of a Registry and Clearinghouse project. Price said that it would be "something like a faculty exchange program" to get academics out into "real-world" environments such as government and industry so that they might update themselves on applied technology.

He added that he hoped the project could start taking shape next year.

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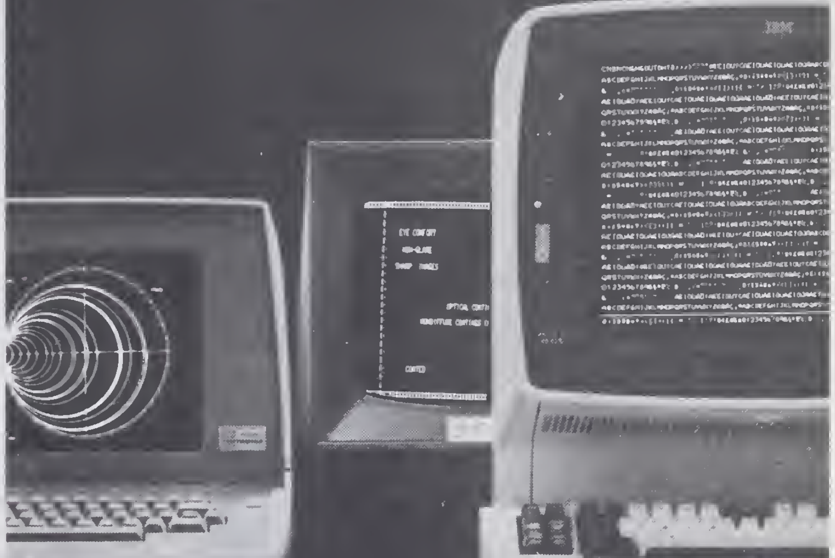

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Guarded Against Terrorists

DP Troika Assisted Olympic Reporters, Vendors

LAKE PLACID, N.Y. — A troika of computer systems at the XIII Winter Olympics here guarded against terrorist attacks, assisted food service vendors and eased on-line news reporting.

In an effort to avoid the murderous attacks that marked the 1972 Summer Games in Munich, the U.S. Customs Service set up a sophisticated screening system to prevent terrorists, drug dealers and other criminals from entering the country during the Olympics. It included a data base with a wide range of information on potential troublemakers, according to a spokesman.

The effort was supported by 45 Beehive International, Inc. Micro-Bee CRTs linked to a Burroughs Corp. B7700 in San Diego.

Suspects were checked out by querying the computer system via the terminals, which transmitted and received data over dial-up telephone lines. Four Timeplex, Inc. T-4 multiplexers, along with two T-16s and two more T-96s, were employed to reduce communications costs.

The Customs Service has used the screening service for many major events, including last year's Pan-American Games in Puerto Rico. It will be used again at the 1984 Summer Olympic games in Los Angeles, according to a Customs Service spokesman.

Retail Transactions

NCR Corp. was chosen by the Lake Placid Olympic Organizing Committee to supply point-of-sale equipment to handle the nearly half million retail transactions that were processed in Olympic venues during the games. NCR provided 112 stand-alone Model 2115 Electronic Cash Registers and a one-day instruction class.

The equipment was used by the two major food service concessioners, Gladieux Food Service and ARA Services, Inc. Some of the 17 units at the Olympic Village and at various press center locations handled several thousand individual transactions on busy days.

At various times during the games, 80 or more individual point-of-sale units were in service at trailers and indoor refreshment stands. There were 444 units placed in the two Olympic Ice Arenas alone. Since all organizations that operated retail outlets in Olympic venues depended on temporary employees who were largely inexperienced in the use of retail systems, an effective training program was essential. The Gladieux staff alone numbered approximately 550, and few of them were experienced in retailing.

In order to make sure that its Model 2115s were used effectively, NCR joined the overall training effort with a one-day program aimed at instructing people who would teach the front-end personnel.

News Reporting

With the world eagerly awaiting details of the Games, reporters for Reuters filed stories on 12 portable lightweight video editing terminals designed by Reuters and driven by three Digital Equipment Corp. PDP-8 minicomputers.

Stories were transmitted to New York via a single 4,800 bit/sec high-speed telephone line. A Timeplex T-16 multiplexer enabled Reuters to configure 10 different channels to handle different local services.

One 2,400 bit/sec channel in Lake Placid supported the 12 CRT terminals, and each of the other nine handled a separate Reuters service.

When the Lake Placid stories arrived in New York City, they were demultiplexed and routed to a DEC PDP 11-34 for onward transmission to London and throughout the world.

The entire system was trucked to Lake Placid in a van and set up, where it ran almost without fail (less than one hour total downtime), for three weeks.

Communications Focus of Seminar

WASHINGTON, D.C. — Telecommunications — including techniques and ways to improve cost performance, reliability and availability of computer communications — will be the focus of a three-day, three-city seminar.

Offered by E.F. McLaughlin and Associates, Inc., the seminar will be held here on April 21, 22 and 23; in San Francisco on May 5, 6 and 7; and in Atlanta on May 19, 20 and 21.

More information is available from E.F. McLaughlin and Associates, Inc., Suite S-1508, 12000 Old Georgetown Road, Rockville, Md. 20852.

STAN WHO?
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See Page 7
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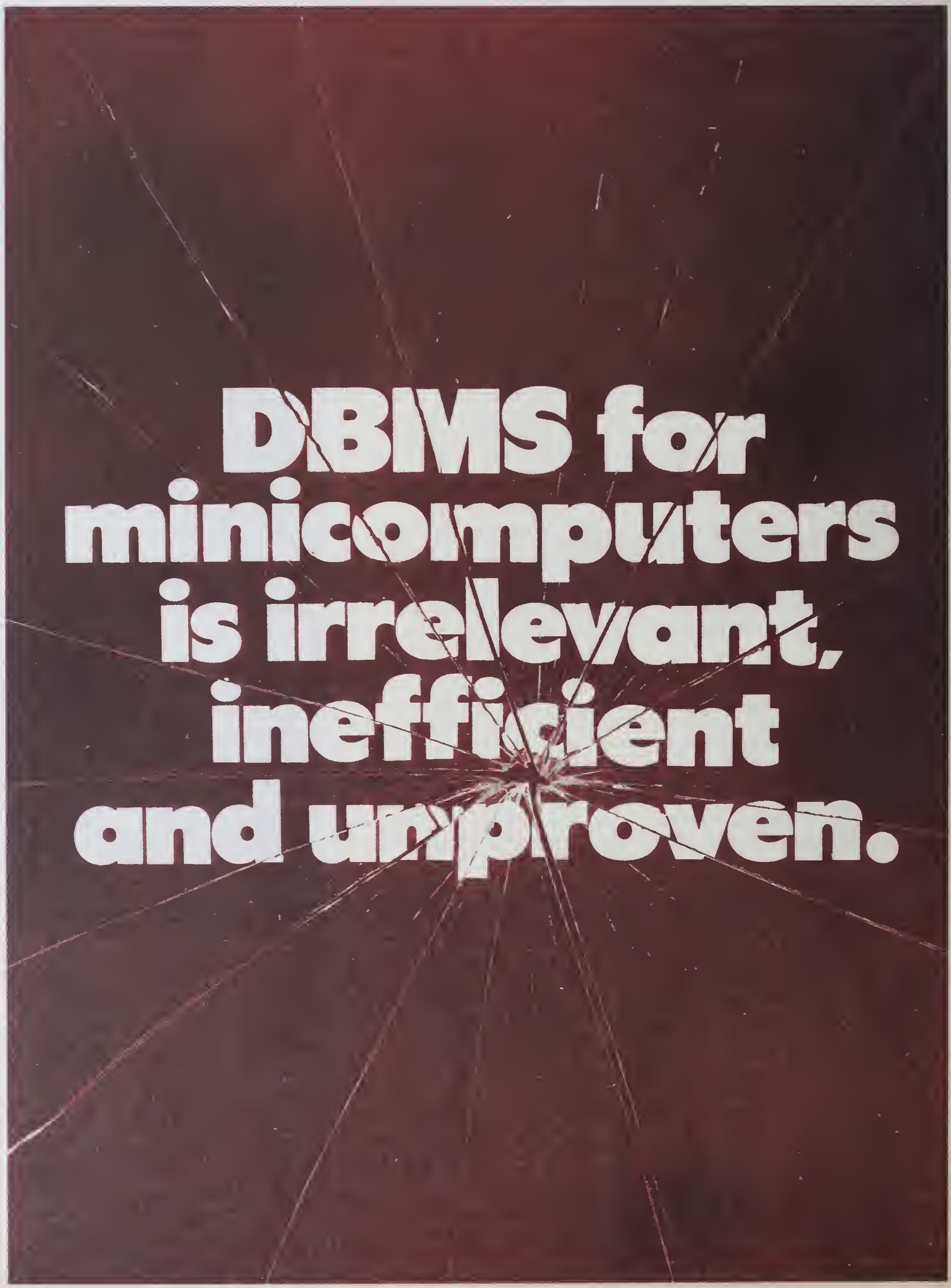
DBMS for minicomputers is irrelevant, inefficient and unproven.

Turnaround Time
By Larry E. Long

Touchy Issues: Worth a Fight

Q Recently I asked our computer center people to make a significant change in our accounts receivable system. Their response left me dumbfounded: They told me that documentation is not complete enough to make such extensive changes and no one is current on the system.

As the controller of a chain of retail outlets with more than $20 million in accounts receivable, I'm concerned.

The person who programmed the system left — under a cloud — over two years ago. Another person was put in charge of updating the documentation three months ago. After completing one-third of the documentation, he resigned.

The computer center director said he can't spare anybody else. Should I continue to press this very touchy issue?

A An undocumented, operational accounts receivable system which has nobody current on it and more than $20 million outstanding is a very serious problem. Someone is toying with the future of the company.

Who sets the priorities? If updating the accounts receivable system is a low-priority project, I'm afraid to ask what the higher priority projects are.

This is a vital issue and worth a fight. You just might save a company!

Q Although my name isn't Pat, I must be the "monotonic slow-talker" referenced in a recent inquiry to "Turnaround Time." I'm going to take your advice and make an effort to develop my presentation skills.

You mentioned that I should get a good book on DP verbal communication, but you didn't make any recommendations. Would you?

A Gladly, but first I would like to take this opportunity to make a couple of important points. First, reading a book on verbal communication will not make someone better at making presentations. Practice, more practice and, finally, confidence are the key factors.

However, a book might contain helpful hints and a checklist to ensure that you cover all of the bases. A colleague of mine who is familiar with the advantages and disadvantages of the books on the market recommended *Business and Professional Speech Communication* by H. Zelko and S. Danse (Holt, Rinehart, Winston, 1978), priced at $35.

Q I'm graduating this year and seeking employment in information systems. During the on-campus interviews, I was invited to three companies in three different states.

The plant visit formats were similar. I interviewed with four to eight people at each site, usually individually. After the interviews, however, I didn't know much about any of the companies and I'm not sure they found out much about me.

Everybody to whom I talked asked the same questions and gave the same information about the company. The interviewers weren't prepared to answer what I considered basic questions about the job and working environment. What could have been exciting and informative days turned out to be rather boring.

What can I do next time to improve the situation?

A You have the responsibility to ask those questions which support your criteria for job selection, and the company has the responsibility to answer your questions. Each of the companies with which you interviewed had an opportunity to make a good impression and perhaps hire you — they blew it.

All too often the front end of the recruiting effort on college campuses is approached with vigor, but the follow-up site visit is not well coordinated and leaves the applicant with a bad impression of the company.

At a minimum, the company should prepare a printer itinerary with names, times, and places — then stick to it. Each interviewer should make it appear that he came to work that day just to meet you.

The company should coordinate the questions and information dissemination so interview time is optimized. Each interviewer could be assigned one of the following topics: corporate benefits, career paths, organizational structure, continuing education. They could also be assigned a general inquiry topic such as the applicant's academic background.

Although more demanding on personnel time, longer sessions with two or three interviewers provide an environment for a more efficient interchange of information.

Perhaps the next company with which you interview will see this column and make a concerted effort to better coordinate your visit. After all, for the moment, it is a seller's market!

Long is a professor at Lehigh University, a DP consultant and author.

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Myth #1. DBMS is for mainframes, not minicomputers.

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Myth #2. Data base management systems for minicomputers require too much overhead.

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EDITORIAL

Regard for the Worker

Hardly a day passes that a reader of general-interest newspapers and magazines does not see a story about a computer foul-up or about computerization's dehumanizing effect on the work environment.

Unfortunately, many of these stories are true. Often systems are installed with little regard for the worker — especially if a project ends up exceeding budget.

Each of us probably knows of an installation whose order entry operation was converted to CRTs and everything was changed but the lighting. Even more chilling to the employee is the highly regarded feature of many of these installations that allows the system to track and report the number of each employee's hourly keystrokes.

Much has also been written about installations using electronic editing, where copy editors who began working on CRTs for the first time reported eyestrain, backaches and other symptoms resulting from changes in the work environment.

This is all unfortunate and gives automation a bad name. It was therefore uplifting to read the results of a study of 12,000 white-collar municipal employees in 42 cities conducted by the Public Policy Research Organization (PPRO) at the University of California at Irvine [CW, March 17]. The individuals surveyed were end users who work with computer-generated data.

The PPRO found that rather than dehumanizing the white-collar work environment, computer-generated information enlarged the scope of workers' jobs and did not increase supervisory control over an employee's work.

There were some negative findings, however: Respondents reported greater job pressure arising from time constraints. Apparently their input is on a tighter schedule while output is often slow.

The PPRO also found that one problem we have been talking about for years — communication with end-user departments — has not improved much. These municipal employees complained of difficulties in their interaction with computer specialists and slow response to their information requests. Let's hope the next time we read the results of such a study that this area is improved.

DATA PAST

Five Years Ago
March 19, 1975

CLEVELAND — The median salary for systems personnel rose to $18,749 in 1974, an increase of 12% over 1971, despite the fact that federal wage and salary controls were in effect during part of the period, a report published by the Association for Systems Management found.

– – –

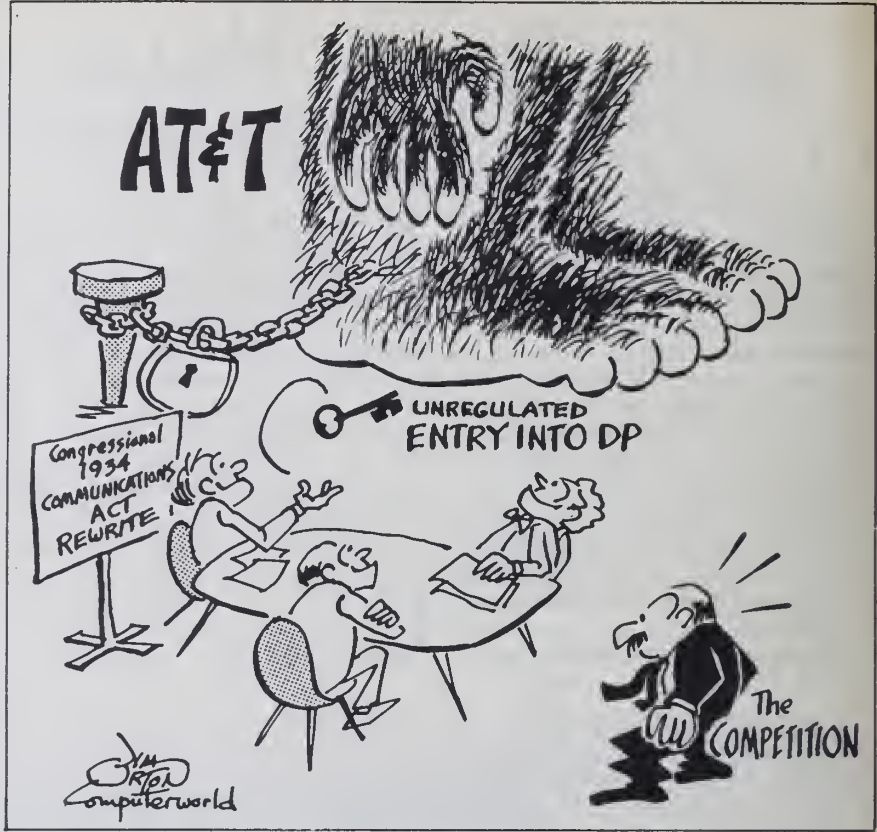
OCEANPORT, N.J. — By converting to 32-bit architecture throughout its Model 8/32 minicomputer, Interdata, Inc. developed a machine it claimed was four to six times more powerful than its older 7/32 mini at less than double the price.

Eight Years Ago
March 15, 1972

SAN FRANCISCO — The temporary restraining order requiring IBM to continue maintenance for users with extended memory equipment from Itel Corp. was extended until the end of the court proceeding in which Itel asked for a preliminary injunction barring IBM from withdrawing maintenance services.

– – –

WASHINGTON, D.C. — Sen. Sam J. Ervin (D-N.C.) charged that computerized dossiers on "hundreds of thousands" of Americans compiled by the Army "still exist" despite an Army order to have them destroyed. The files included information on congressmen, state and local officials, he said.


AT&T
Congressional 1934 COMMUNICATIONS ACT REWRITE
UNREGULATED ENTRY INTO DP
The COMPETITION
Jim Orton
Computerworld

LETTERS

OECD Guidelines

I was disturbed by "International Treaty on Data Protection, Privacy in Limbo" [CW, Jan. 28]. The article contained several errors and presented a misleading — and unjustifiably pessimistic — impression of the prospects for the guidelines developed by the Organization for Economic Cooperation and Development (OECD).

I am aware of the difficulties in following an international agreement through its complicated pathway, but the guidelines should not have been referred to as a "draft treaty," for they are definitely not a treaty. In addition, the OECD secretary general would not refer the guidelines to the "Council of Europe," but to the Council of OECD.

As a U.S. official directly responsible for the initiation and negotiation of the guidelines, let me state categorically that the guidelines are alive, they have not collapsed and they are still in active negotiation. Moreover, I am confident that the guidelines will be taken up by the OECD Council very soon and will be adopted by OECD governments in a very few months.

I think that it would only confuse things further if I were to attempt a point-by-point clarification. But I would like to give you an up-to-date summation of the recent state of play on the guidelines. Here it is.

Last November, the OECD Committee for Scientific and Technological Policy received the draft guidelines from its subsidiary bodies, particularly the Experts Group that was established a year and a half earlier to prepare the draft. The committee agreed that the guidelines should be transmitted to the OECD Council.

Some members of the committee stated at the time that their delegations had reservations about certain parts of the text. The committee decided that committee members should review their governmental positions in capitals and submit in writing any remaining governmental reservations "of a political nature." The committee asked for such statements no later than Jan. 18.

The committee also agreed that its chairman would submit the guidelines to the council after receiving the government memoranda; the chairman would prepare a transmittal letter which would incorporate any political reservations and propose that such reservations be resolved at the council level.

Most of the oral reservations had been dropped by Jan. 18; however, some reservations were expressed in writing. Negotiations have continued on remaining reservations in an effort to remove them.

In the past, *Computerworld* has made a conscientious effort to be accurate and fair. Nevertheless, a serious error has been made and I would like to set the record straight.

Morris H. Crawford
Deputy Director
Office of Cooperative Science
and Technology Programs
Bureau of Oceans and International
Environmental and Scientific Affairs
Department of State
Washington, D.C.

Nine-Digit Zip

In response to W. Wayne Carson's letter, "Handling Nine-Digit Zip" [CW, Feb. 4]: Packing the field is certainly an excellent idea, but the crux of the problem is not the initial space needed for storing the number, but the redesigning of the many forms that exist so that they will accommodate the additional digits.

In my case it will mean new order, invoice and statement forms, plus the changing of a number of programs that reference the Zip Code field.

If my relatively small installation is any example of the expenses and time involved to answer the problem, then I feel that the end result will probably cost more than the benefit.

Steven B. Galkin
Long Island City, N.Y.

READER COMMENTARY R.L. Graham

Soviet Algorithm's Value Theoretical, Not Practical

I think it is essential for the readers of *Computerworld* that the facts be set straight concerning the pros and cons of the recent "Soviet" algorithm for linear programming, in view of the widespread media coverage it is receiving. In particular, it is important that the factual errors in Dr. E.H. McCall's remarks be corrected [Reader Commentary, CW, Feb. 25].

To begin with, it is necessary to recognize clearly the distinction between the *theory* of linear programming and the *application* of various linear programming algorithms on problems of current interest. No one has ever claimed that in its current form, the Soviet (or ellipsoid) algorithm described by Khachain would be particularly effective in solving ordinary linear programming problems. It was never designed to do so.

What is important is that it provides the first method for guaranteeing that all linear programming problems can be solved in an amount of time that only grows as a *polynomial* in the size of the problem, as opposed to an *exponential* function of the size of the problem. This distinction is fundamental and lies at the heart of modern developments in computer science.

Indeed, what most researchers consider to be the leading open question in theoretical computer science is whether problems such as the travelling salesman problem (or more generally, any of the so-called NP-complete problems) can have polynomial time algorithms.

The problem of trying to find a polynomial algorithm for linear programming had been around for many years and had stubbornly resisted the efforts of many of the best minds in the field. As George B. Dantzig of Stanford University, one of the chief architects in the development of linear programming over the past 30 years, put it, "A lot of people, including myself, spent a lot of time looking for a polynomial time algorithm for linear programming. I feel stupid that I didn't see it."

The "breakthrough" referred to in the article in CW [Dec. 10] is that the ellipsoid method finally resolves this question and provides the long-sought polynomial algorithm. Indeed, this was rather carefully spelled out in the earliest articles on the subject — for example, in Gina Bari Kolata's *Science* article of Nov. 2 in which she displays in a large box: "The immediate importance of Khachian's result is theoretical."

In spite of these warnings, a number of investigators have performed extensive computations using the crudest forms of the ellipsoid method for solving linear programming problems. Not surprisingly, it doesn't begin to be competitive with the best "practical" algorithms, such as the simplex algorithm. However, various modifications of the ellipsoid methods are being experimented with and, even here, the results are surprisingly encouraging. Work has been done by Y. Krol and B. Mirman at Arcon ("Some Practical Modifications of the Ellipsoid Method for LP Problems" [preprint]), P.C. Jones and E.S. Merwil at E.G. and G. Idaho, Inc. and S. Halfin and W. Mammel at Bell Labs.

The main impact of the ellipsoid method, however, is the alternative point of view it provides for approaching a variety of combinatorial optimization problems, linear programming being a particular special case. On this point, McCall was completely off base. For example, the striking results of Grotschel, Lovasz and Schrijner ("The Ellipsoid Method and Its Consequences in Combinatorial Optimization," Report #80151, Institute for Operations-Research, University of Bonn, January 1980), based on the ellipsoid method, settle a number of pre-

(Continued on Page 23)

READER COMMENTARY/Jerome Garfunkel

Chinese Must Encourage Sharing of Technology

I recently returned from a trip to China, having visited some of the same institutions mentioned in "Chinese DP Suffering From Cultural Revolution" [CW, March 3]. While I agree with many of the observations reported in that story, I would like to share some additional ones.

Chinese culture traditionally has encouraged self-reliance at all levels. For example, farm communes are structured to be socially and politically self-sufficient; and universities tend to be independent and competitive with one another. This self-reliance is counterproductive to a society trying to climb out of an era marked by the Cultural Revolution, when technological growth was put on the shelf.

Indeed, China needs to encourage the sharing of technological advances among its various academies and universities and improve communications — both hardware and interpersonal. This is essential if China expects to modernize as rapidly as it initially hoped when its modernization program was announced some time ago.

It seems equally important that the Chinese scientific community, acting collectively, link into the international scientific community. My invitation to China, along with invitations to others, is evidence that the Chinese recognize this.

In the area of systems software development, it behooves China to stay close to international standardization activities like those of the International Standards Organization and the various committees of the American National Standards Institute. Furthermore, it would clearly be beneficial for various academies and universities, acting as a consortium, to contribute to the future development of standardized system software by following closely, and perhaps dealing with Cobol, data base management and operating systems control languages.

It is my intention to contribute some of my energy toward this goal.

Garfunkel is president of Jerome Garfunkel Associates, Inc. in Great Neck, N.Y., and is a member of the Codasyl Cobol Committee.

HUMAN CONNECTION/Jack Stone

DP Managers Must Assess System Practicality

Stories of failures in large-scale government systems were splattered over the front pages of the Washington, D.C. daily newspapers for three consecutive days recently. In this article, I draw some conclusions from these reports regarding management responsibilities toward assessing factors of large-scale system "practicality."

On March 10, the *Star* said that a team of government auditors found that "the worldwide computer system built to warn the president of an enemy attack or international crisis is prone to break down in crisis situations." The article noted that the system consists of 35 computers, connected by a complex communications network involving cryptographic devices and "ultrasophisticated" sensors, and went on to say that after $1 billion has gone into making the network work since the machines were installed a decade ago, it is " . . . at best very fragile."

On March 11, the *Post* wrote about how American computer system vendors — nearly all the major ones — sold products that were "far beyond Iran's real needs or capabilities" and that executives from these firms "now acknowledge that much of this equipment never became operational because of its complexity and the lack of qualified Iranians to run it." One of them said, "The Iranians were willing buyers but the Western burden is there."

On March 12, the *Post* told about the computer system failure that cut off *all* power to the Metrorail system for a large part of the morning rush hour. Only 80,000 riders were inconvenienced. The multiplexer feeding signals from the control center to the computer system failed, and power-up commands could not be processed. Workers had to rush out to field stations and turn the power on manually.

This article is 10th in a series, "DP Management in the '80s."

Deja Vu

These stories would represent a shocking indictment of the computing industry were they not reminders of similar situations that have occurred in earlier generations. How many of you remember the "L-System" disasters that the Air Force laid on us in the '60s? To enlighten the new DPers, I should note that these were national or global computer/communications systems on which untold millions of dollars and thousands of man-years of effort were spent — and none of them worked right.

What's new about Americans unloading computer products on Third World nations, where they will certainly be useless since they were even of questionable effectiveness in the U.S.?

And I wonder how many computer-based public systems are around that have adequate back-up facilities in the event of failure of a major systems component.

Engineering professionals use a phrase to describe complex systems feasibility: "engineering judgement." It may be based on experience or education or born-again wisdom or intuition or a combination of all of these, but good engineers "know" from the beginning if a system if "practical." And this is a potent term to use, because it describes — to me, anyway — a system that is realizable, designable, implementable, operable, maintainable and does the job in an economical way.

Really now, don't most of us know what can be accomplished in a realistic way — for reasonable application of resources — without resorting to extensive studies and analyses? For instance, surely one member of the 1970 Pentagon brain trust should have "known" that a vast network of computers based on then-current technology would not support the critical information needs for national security and scrapped the idea before the hardware was shipped. And, certainly, at least one member of the Metro system design team should have "known" that giving up systems redundancy at a critical point along the information circuit was not the way to save some pennies.

In other words, DP managers in coming years should place some initial conditions on large-scale system concepts which deal with the system's practicality. With funding levels that make sense. With a realistic maintenance ability. With people with the skills to operate it. With the system's total benefit and value to the ultimate users.

By doing this, maybe they can screen out much of the idiocy that sometimes seems so pervasive in this industry, before it roots and takes hold.

LETTERS

Green Thumb's Impact

I have just finished reading "Consultant Throws Cold Water on Predictions for Home Nets" [CW, Feb. 25].

As the manager of software development for the Green Thumb State Software system, I would like to point out certain facts that Bill Von Meister may not be aware of.

The Green Thumb Box is an intelligent interface between a television set and a communications network. The Green Thumb Boxes, under test at Kentucky, cost approximately $215 each. To limit the terminal connect time and reduce both hardware and communications costs, a modified batch modus-operandi was chosen.

Prior to dialing into a county processor, a store-and-forward device, the farmer chooses his screens (up to 8K bytes of memory). The farmer may enter weather observations (up to 412 bytes of memory). Only a few farmers will enter this memory. After the screens are selected and user input, if any, is entered, the farmer dials into the network. Immediately after the information is transferred, the line is disconnected.

This technique allows us to service a higher proportion of users per port than traditional time-sharing.

The current transmission rate from the Green Thumb Box to the county processor is 300 bit/sec. As the price of 1,200 bit/sec service decreases, this may become an attractive enhancement to the Green Thumb Box.

As part of the Green Thumb experiment, different levels of output (2K, 4K, 6K, 8K) will be tested, and loading of the rural network will be analyzed.

I trust this clarifies somewhat the impact of Green Thumb on telephone networks.

Mark J. Shurr
Manager, Software Development
Project Green Thumb
Grumman Data Systems Corp.
Bethpage, N.Y.

How About Solutions?

OK, Jack Stone — come out from wherever you're hiding! I know you're around here somewhere because your series "DP Management in the '80s" is a perfect reflection of my organization, my DP operations and my problems.

So far, through article No. 7, you have described exactly what is wrong with the shop and the organization and exactly how it ought to be instead. You've only left out one teeny little thing: how to get there from here.

How do I get my people to generate documentation when they are already working overtime just to keep our act together? With only three programmers in the shop (and I'm counting myself), how do we rid ourselves of the endless maintenance which takes (wastes?) so much time?

How do I get users who have been waited on hand and foot for 10 years to design and run their own applications via a data base management system (DBMS)? How, for that matter, do I get the holder of the purse strings to spring for a DBMS? They don't give those away, you know.

How can I improve the organizational image of the DP department when our users bad-mouth us because we won't print their reports sideways on the page? One VIP had the temerity to tell me that we were of no service to the organization because we didn't say "How high?" when he said "Jump!" How do I promote myself into the top-level management when they question the significance and even the necessity of the DP function?

How can I sell them on long-range planning when they think that having bought some hardware, that is all we'll ever need? Even when I produce figures documenting our increased requirements and obligations, how do I avoid a pitch for additional resources being labeled "empire-building"?

What happens when the funds I require get taken from some other department's budget, and that department is well aware of it? What if that department is one of the ones which "doesn't believe in computers"?

In one sentence, how do you change the perspective of an entire organization? Personally, I like the idea of decentralizing the DP operation to the extent that the users become responsible for their own applications. That frees us to do the stuff that really requires an in-depth knowledge of the machine and its software.

But our users have an interesting DP dichotomy: On the one hand they are threatened by their dependence on us, and on the other they are unwilling to learn enough about it to protect themselves. There are some who refuse to even recognize the dependence and thus treat DP like some fifth wheel and assume it isn't worth knowing about.

We have, in light-hearted moments, been tempted to lock our doors and go on vacation for two weeks. That would certainly wake up the latter group and scare the hell out of the former. It would also reinforce an erroneous viewpoint. Unless we have the support of top management, we cannot change our image. Unfortunately, some of those users are top managers.

I hope Stone will get into the nitty-gritty of implementation in future articles. But he might as well crawl out from under our raised floors, because he isn't going to get much input from us on this part of the problem.

E.G. Johnston
Westminster, Md.

Topic for Debate

In "The Myth of Software Maintenance" [CW, Feb. 18], D. McNeil made the unusual statement: "Perhaps, after all, the engineering of quality software is inevitably expensive and time-consuming, but it need not be the source of as much dissatisfaction as it is now."

If McNeil would expand on this statement, it might lead to a worthwhile debate about the realized benefits of new methods of writing software. His statement appears to run counter to the claims of Yourdon, DeMarco, Orr and others who claim that structured methods allow software to be written in less time and at lower cost than was previously possible. The proponents of structured methods imply strongly that their techniques also lead to greater job satisfaction.

It appears that McNeil's experience has given him a different view of the effects of structured methods.

Perhaps *Computerworld* could set up a forum to discuss current software engineering methods.

John Boddie
Newark, Del.

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LETTERS

No-Data Situations

I must take issue with "Loops and Firm Foundations" [CW, Feb. 18].

For the most part, the article spent many words trying to get some fairly simple concepts across. To Roger House's credit, he was trying to clarify the confusion that exists between the specification of pretest and posttest loops. In this respect, I applaud the effort and support him in his contention that the syntax of existing languages tends to be misleading. A standard in this matter is desirable.

However, I am appalled at House's confusion over the situation of no data vs. data of zero value. The absence of data does not mean that the data has a value of zero. House chose to illustrate his position by selecting an application where, within the application, the definition of a file containing no records was that the content was zero. But I must stress that in this case, the value of zero is a property of the application, not a property of the fact that there is no data.

House has fallen into the trap of failing to recognize certain properties of data. Regrettably, he is not alone in this. Most programs are written for valid data. However, there are two properties of data which are seldom handled at all. These are validity and existence.

Invalid data is data which has simply gone bad. This can be caused in many ways; a common instance is division by zero. Programs that don't stop at this point inevitably leave something in the target field. The next time this something is used, it is treated as a valid number, generally with disastrous consequences.

The point here is that just because the field contains a value does not make it meaningful. We need to know if the value is valid — a point that the majority of programs simply assume.

The property of existence arises when we simply don't know what the data is. This can occur when a record does not exist on a file or when data was never entered into a field. Good programming practice generally causes a data space to be initialized to zeros upon creation. This means that if nothing were entered into the field, the first user would find a zero. This contributes to the fallacy that unentered or nonexistent data is the same as zero.

Consider the problem if we have a personnel file containing a salary field. If for some reason salary hasn't been entered, this piece of data is missing; it is certainly not zero. If practice called for initializing a data space to a string of binary ones, then unentered data would certainly not be zero.

Neither the property of validity nor existence can be handled by the content of the data field. These are properties which must be maintained in addition to the content of the field. Because this is seldom done, invalid and "missing" data frequently causes incorrect program operation.

Again, I applaud House and his efforts to bring clarity to the subject of loop construction. However, I beg him not to do it at the expense of introducing incorrect and misleading concepts on the subject of data existence.

Fred Braddock

Canogo Park, Calif.

Contradictory Example

"Loops and Firm Foundations" [CW, Feb. 18] was, I thought, generally a well-written article of some significance. I got violently upset, however, when I read the last section.

Roger House's example of a bad process loop contained only one READ statement. His good example contained two READ statements. This was in direct contradiction to his own definition of good and bad. Also, the second example was more verbose and, consequently, less clear.

I strongly favor the first example. As you might expect, I prefer a slightly different set of code. I am a strong advocate of the Cobol "PERFORM paragraph THRU paragraph exit" construct. I feel that the exit statements add clarity by clearly defining the end of a group of performed code.

I also advocate the unforgivable sin of using the GOTO statement. Before 50 purists start the lynching, let me add that I try to limit my use of the GOTO statement:

- Always refer to a paragraph lower in the source code. This is a good policy for the PERFORM verb, too.
- Generally, the GOTO should refer to the next paragraph in the source code. This will usually be an exit paragraph. One notable exception is an edit routine which is to report the first error found (useful in low-volume, online applications). In this case, "IF condition GOTO paragraph/section exit" seems much clearer than umpteen levels of nested IF statements.

My preference for a basic process loop is:

```
WORKING-STORAGE SECTION.
01 SWITCHES
  05 INPUT-EOF-SW    PIC X(1)    VALUE 'N'.
     88 INPUT-EOF                VALUE 'Y'.
PROCEDURE DIVISION
nnnn-para.
  PERFORM 2000-PROCESS-INPUT THRU
  2999-EXIT
     UNTIL INPUT-EOF.
       •
       •
       •
2000-PROCESS-INPUT.
  READ file name
    AT END
      MOVE 'Y' TO INPUT-EOF-SW
      GOTO 2999-EXIT.
  Code for necessary processing. PER-
FORMed paragraphs would be in the 2000
range, if they are small and unique to this
process. They would be numbered at or
above 3000 if they are large or sections or if
they are common to at least two routines in
the program.
2999-EXIT
  EXIT.
```

Even with that ghastly GOTO, I feel that this code structure is readable, easy to modify and meets the criterion of having only one READ statement per input file.

House and I agree on the subject of executing a report program with an empty input file. We all know that the 11th Commandment states: "Thou shalt execute each and every report in each and every job."

The 12th Commandment, of course, states that "The first thing that shall be done in any report program is to print a page heading; the last shall be to print an end-of-report line."

This practice ensures that the user knows that the report has been run and that no pages have been lost.

H.R. Sides

Satellite Beach, Fla.

Computerworld welcomes comments from its readers. Letters should be addressed to Editor, *Computerworld*, 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.

Controls Necessary

I'd like to respond to the letter "Fewer Controls Please" [CW, Feb. 25].

Apparently the writer is either employed by an oil firm or the federal government or is the type of guy who says "I don't care what the price is, just fill it up."

Sorry to say, not all people have money coming out of their selfish ears. People are cutting down on recreation, dining out and other of the fine things in life in order to keep their tanks full enough to travel back and forth to work. The reason for this is the rising price of oil and gas, which indirectly affects part of the increases in other products.

Recession or worse is in the future, because of greed.

I, for one, agree with the author of "A Proposal for Gas Rationing" and would like to salute him for a fair solution to our problem.

Richard T. Hevert

Suncook, N.H.

Algorithm Has Value

(Continued from Page 21)

viously unsolved problems in combinatorial optimization. And the expectation among many experts is that this is just the beginning.

Indeed, it was in large part because of the confusion surrounding the ellipsoid method (as illustrated by McCall's column) that the workshop was held at the IBM Systems Research Institute in New York City by Michael Held and Philip Wolfe (see the excellent CW Feb. 25 report on this). I think that the general feeling of the participants there could be summarized as that of "guarded optimism" with the realization that a lot more work in the whole area remains to be done.

I hope these remarks help clarify the murky waters which inevitably get churned up by misunderstanding and incomplete information.

Graham is head of the Discrete Mathematics Department at Bell Laboratories in Murray Hill, N.J., and is a visiting professor in the Computer Science Department at Stanford (Calif.) University.

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THE TAYLOR REPORT/Alan Taylor

Obsolete D.C. System Proves Danger to Parkers

When Rep. Warren E. Barry of Virginia heard that the Washington, D.C. authorities had mistakenly seized and towed the 1979 Datsun of reader Lawrence E. Blackhurst Jr. of Virginia, he wasn't surprised. Blackhurst owed no parking fines at all, and the district's target had actually been a Cadillac owner who had accrued tickets in 1976 and 1977. What would have astounded Barry, he said later, would have been if the D.C. authorities had "mistakenly done something correctly."

The situation arose out of the abuse of a perfectly good (for its time) computer program by people who seem to think that programs keep up with modern technology by themselves.

The program concerned is a simple on-line data base of scofflaw license numbers and other dates, operated by the district's Department of Transportation. The input is tickets issued and payments made. In addition, where out-of-state licenses are concerned, the system occasionally adds some names and addresses of license holders and lists of reissued number plates that have gone to new owners.

These lists of input from outside states don't come free to the district. True, Virginia is prepared to send lists of transfers of all tags to the district, apparently without charge. Still, the district has to bother to ask for them and has to do the necessary matching. Virginia tags that are surrendered are not immediately reissued, but are kept dormant for at least 12 months afterwards. From a systems point of view, then, this input is needed every 12 months if the license plate is to be regarded as identifying a specific car or its owner.

(Maryland, another adjoining state, objects to doing work for what it sees as D.C. benefit and won't send the tapes over as a courtesy. The state will cooperate if the district will pay the bill, however.)

Currently, it appears that neither Maryland records nor Virginia records have been used to clean the D.C. scofflaw files for many years, and certainly not for more than two years. As a result, out-of-state records are known to be untrustworthy by the people running the system, such as the department's Boot Squad supervisor, Don Helenius. Records regarding special plates, including vanity plates, are particularly untrustworthy.

Helenius dislikes vanity plates and thinks people should realize that the Boot Squad places boots according to license plate number alone, not according to type of car. He thinks this system is perfectly OK, even though mistakes can be made. The source of the data he and his department use is out of their jurisdiction. (In the present example, the Datsun and Cadillac both had the plate "QIK 1.")

Check of Contraindications

At one time, there was no problem with transferred plates, so the district's system was adequate. Now, however, the system has obviously become obsolete. People don't check contraindications as well as a computer can, but because of the powerful position of the district government, no one can make the authorities care. (Ever try to sue a local government?)

The modern system that should be installed — it would only take a day to do — would require that a computer approval be issued *before* a car is booted. It wouldn't take the Boot Squad any longer to get the approval than to get a credit card transaction verification. The squad would call in on their radios, and the system would check on items like car makes, timeliness of input and so forth.

People tend to trust computers, and when a computer gives two characteristics, such as car make and tag plate, people regard this as being a flat statement that the tag is attached to a car of that make. Any evidence to the contrary is ignored; indeed, at one time the district people waited to see if the record was just going to be altered from Cadillac to Datsun!

The computer system is also at fault for not marking those long-lapsed, unidentified tickets as being "dubious." I don't know the local law, but I doubt that it allows the seizure without notice of any but known-guilty vehicles.

The tendency to keep systems running, even when they are obsolete, is dangerous.

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WHAT'S STAN SELLING?

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See Page 7
IF YOU DARE.

By Upgrading MP/OS for Nova 4

DG Makes Three Machines Compatible

By Marcy Rosenberg
CW Staff

WESTBORO, Mass. — By upgrading the MP/OS multitasking operating system to run on Nova 4 minicomputers, Data General Corp. for the first time has begun offering compatibility across its Micronova, Nova 4 and Advanced Operating System (AOS)-based Eclipse processors.

MP/OS is AOS-compatible, but was previously available only on DG's 16-bit Micronova microcomputer line, according to Jim Isaak, general systems software product manager. Nova 4s supported only the Real-Time Disk Operating System (RDOS) family which includes RDOS, the Real-Time Operating System (RTOS) and DG's Disk Operating System.

With the ability to also support MP/OS, Nova 4/S and 4/C system users now gain an operating system that is compatible with AOS and that supports DG's MP/Pascal language, to which the firm has added multitasking capabilities for MP/OS and AOS, Isaak said. RDOS does not support Pascal.

Stating that most MP/OS utilities are operationally compatible with AOS, he admitted, however, that the MP/OS interactive debugger is not because it operates in the same address space as the AOS user.

Isaak defined three target markets for the upgraded MP/OS: new Nova 4 users, existing users that want to upgrade from RDOS to AOS and users that plan to build a distributed processing network with an AOS-based host tied in to remote Nova 4s and Micronovas.

DG expects associated uses, however, to be primarily of a noncommercial nature for such multitasking applications as process control, data collection and laboratory operations.

Because MP/OS provides neither multiuser nor Isam file management capabilities and does not support Basic or Cobol, commercial end users will likely select RDOS or DG's Disk Operating System over MP/OS, Isaak explained.

Among the capabilities MP/OS reportedly does offer Nova 4 users is access with only one disk seek to information anywhere in a data file with up to 576M bytes. Most operating systems will require multiple disk seeks to randomly access data in a file of that size, he claimed.

RDOS files, for example, are limited to 33M bytes where contiguous files can achieve single-seek access and random files cannot, according to Isaak.

Disks supported under MP/OS include DG's 25M-byte Model 6103 14-in. Winchester disk, 1.26M-byte Model 6097 dual-sided, dual-density floppy diskette and cartridge disks. Other DG peripherals supported by

(Continued on Page 30)

IBM Users Get Security Aid

DALLAS — A data security package for IBM and compatible systems running under VS1, MVT or MVS is available from Electronic Data Systems Corp. (EDS).

Called Security Access Controller (SAC), the integrated security package is said to provide system entry protection for job submission, Time Sharing Option (TSO) log on, class and priority usage and data set protection. SAC also offers activity logging and management reporting, which provide auditability and accountability to the system, EDS claimed.

SAC control is based on user verification; TSO and on-line sign-ons include provisions for user identification. JCL statements reportedly determine batch user identification through a user-specified process.

A security identification code may be qualified by the method and source of entry. This can restrict users to enter the system via TSO at specific locations.

Batch work may require further authorization before execution, the vendor noted.

Once in the system, batch or interactive users can be further restricted during execution by SAC checks that prevent unauthorized access to data sets.

SAC is driven by edit criteria defined in an access control language. The access control statements are user-oriented and do not require extensive data processing expertise, the vendor said.

A perpetual license for SAC, which requires a minimum of 6K bytes of memory per CPU, costs $15,000. Multiple CPU discounts are available, the vendor said from EDS Center, 7171 Forest Lane, Dallas, Texas 75230.

IMS-to-IDMS Conversion Eased

WELLESLEY, Mass. — IBM users reportedly can convert from IMS to Cullinane Corp.'s IDMS data base management system without losing their investment in DL/1 programs by using a new product from the independent vendor.

Called Escape, the software is a DL/1 interface to IDMS which translates DL/1 calls into IDMS requests at execution time, a Cullinane spokesman said.

Calls are translated using control information that defines a correspondence between the hierarchies viewed by the DL/1 program and record/set information in a subschema describing the IDMS data base, he explained. The user provides some control calls to the Escape compiler to generate the control information.

Escape, which is said to be transparent to DL/1 programs, runs on IBM 370 processors — Model 115 and larger — 30 series, 4300 and compatible mainframes. The interface requires 50K bytes of memory.

Escape operates with IDMS Release 5.0 and the most recent 5.5 in both local and central operating modes. Operating in local mode, only a single local program can access IDMS at one time; central mode allows the DL/1 program to execute concurrently with other DL/1 and IDMS batch and teleprocessing programs.

Although Escape licenses for $15,000 with a 10% annual renewal fee, use in the central mode requires the IDMS Central Version option, which costs $20,000. Users planning to operate Escape in the local mode need no options, but neither will they have concurrent access of IDMS as allowed in the central mode.

Cullinane is at 20 William St., Wellesley, Mass. 02181.

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Oak Releases Receivables Package

LARGO, Fla. — Oak Software has released an accounts receivable package for IBM System/34, System/32, System/3 and Wang Laboratories, Inc. VS computer systems.

In addition, the firm released an updated version of its word processing package that supports nine-digit Zip Codes.

The Open-Item Accounts Receivable System features sales, cash receipts, service charge and adjustments journals; a delinquent customer listing; an aged trial balance that can be printed anytime; and sales analysis and commissions, according to the vendor.

The accounts receivable package costs $2,500 including source programs, documentation and training. Without installation the package costs $1,500.

Release 2 of the Word Processing System for IBM System/34, System/32 and System/3 users is said to offer capabilities to handle nine-digit Zip Codes, identify misspelled words, handle hot zone processing and add page numbering, headings and footings.

The word processing package costs $2,500 including source programs, documentation and on-site installation. The package costs $1,500 without installation from Oak Software at 14377 Valentine Drive, Largo, Fla. 33540.

DBMS Runs On VRX

PLEASANT HILL, Calif. — Century Analysis, Inc. has expanded its Plus/4 data base management system (DBMS) to run on the NCR Corp. VRX operating system.

With this upgrade, Plus/4 will now operate on all NCR N-Mode (batch-oriented) and V-Mode (virtual memory) operating systems, according to Century Analysis.

Plus/4 licenses for $10,000 from Century Analysis, 3343 Vincent Road, Pleasant Hill, Calif. 94523.

MP/OS Upgraded for Nova

(Continued from Page 29)

MP/OS are the Dasher D100 and D200 terminals and 800/1,600 bit/in. magnetic tape units.

The multitasking operating system does not support 50M-, 96M-, 192M- or 277M-byte disks of the IBM 3330 class.

Other MP/OS features include the ability to automatically perform code and data consistency checks during "idle" time, that is, when the computer is waiting for tasks. A fix-up facility is said to maintain disk file integrity by automatically validating the disk structure at initial system load and restoring it if necessary.

In addition, the MP/OS Command Line Interpreter (CLI) is a subset of the AOS CLI that provides a free-format English language style for interactive program development, Isaak said.

MP/OS uses a minimum 5K bytes of memory on the Nova 4, not including memory resources required for the user application.

Nova 4 MP/OS licenses for $2,000. However, the firm recommends as a minimum runtime system configuration a Nova 4/C with 64K bytes of random-access memory (RAM), real-time clock and multiply/divide which together cost an additional $4,000.

A minimum development system configuration — consisting of a Nova 4/C with 64K bytes of RAM, 2M-byte disk or diskette, a real-time clock, multiply/divide and a Dasher D100 terminal — will run $22,000.

For the Nova 4 MP/Pascal, which licenses for $2,000, a minimum runtime system configuration costs $5,800 for a Nova 4/C with 32K bytes of RAM, real-time clock, multiply/divide and a Dasher D100 terminal.

DG is at Rte. 9, Westboro, Mass. 01581.

'CDPS' Extended For Wider User Range

CINCINNATI — A modular distributed data base/distributed processing package originally designed for the IBM Series/1 is now available for Perkin-Elmer Corp. Interdata 7/32 and 8/32 minicomputers as well as Sentinel, Inc. A8086 minicomputers.

The Champion Distributed Processing System (CDPS) from Tominy, Inc. can also be used to shift Series/1 applications to IBM 4331, 4341, 360 and 370 mainframes, the vendor said.

The package ranges in price from $5,000 to $17,500, depending on selected modules, and requires between 20K and 32K bytes of memory, the vendor said from 4152 Crossgate Drive, Cincinnati, Ohio 45236.

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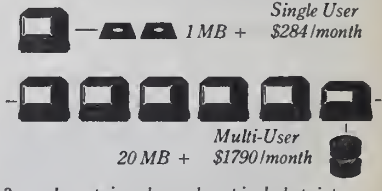

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'System Design Errors Impact My Existence'

Data Base Corner

By Stephen L. Robinson
Special to CW

I used to laugh at the preposterous plots for many TV detective shows. Our heroes, even when on vacation, seemed always to be on the scene when some criminal act took place.

When a drugged jockey fell from his horse, for example, they just happened to be spending their day off at the racetrack. When a visitor to Sea World who couldn't swim was nudged into the whales' pool, our heroes were there entertaining a visiting relative.

Now, however, I don't laugh anymore. The number of DP system design errors that have impacted my existence recently must certainly not be typical of the average American's encounters, but they have happened nonetheless. Is it a conspiracy? Or do such problems seek out those people most likely to be upset by them?

For example, I recently received my monthly bill for gas and electricity from the Philadelphia Electric Co. [Peco]. The electric bill was its usual absurdly high figure, but it was dwarfed by the gas bill: more than $800 for one month.

This from a house where the gas bill has been a constant zero for the last year or so. The only gas appliance in the house — which for the last year has served as my office — is a stove that is used to make an occasional cup of tea or hot chocolate (the coffee maker is electric).

Surely a "reasonability" check could be inserted in the billing algorithm to unearth such absurdities or, even more importantly, to identify potential sites of gas leaks. In my case, the gas meter reading of 6,506 was either misread, misinterpreted or misentered as 8,506. Because the 6,506 is unchanged from January of 1979 — and since 2,000 units would be close to a yearly figure for a house with gas heating and all gas appliances — a flag should have gone up somewhere to trigger a rereading of the gas meter and/or a check of the gas line.

Instead, I will probably be subjected to a now-familiar fight to "get even." I expect a reply shortly. It will probably be a form letter telling me my account is overdue, with no acknowledgment of my letter. If things hold true to form, I will probably have to make several telephone calls and write one or two more letters to straighten out things.

A Duplicate Case

A similar situation has been going on for three months now with my leased copier. Every month I send the company a card indicating the present meter reading. The company subtracts the previous month's reading and bills me a fixed fee for 6,200 copies or less per month and charges a per-copy for each copy in excess of 6,200.

In November, I filled out the card and placed it in the "to be filed" pile rather than the "to be mailed" pile. This came to light when I received the bill for the month. In the absence of an input card, the company had assumed a usage of some 12,000 copies, somewhat more than double my usual monthly total of 6,000.

There was no indication on the invoice that the usage was an estimate, nor did the absence of input for the month produce a follow-up request for a correct meter reading.

Searching through the piles of paper that typically obscure the surface of my desk, I located the missing meter reading and forwarded it to the company along with a note of apology. Here things got truly interesting.

A real human being took over the disposition of the problem. I assume this to be the case since the amended bill I received had a rather flagrant arithmetic mistake.

My actual number of monthly copies was 7,520. After the "free" 6,200 were subtracted, I should have been billed for 1,320. However, the invoice showed 1,720 copies. Hopefully this was a human error, not the computer program's goof.

The computer system, unfortunately, soon demonstrated that it did not know about the amended bill. About two weeks after I sent the company a check for the correct number of copies, I received another dunning notice for the 1,200 copies. Again, a long frustrating struggle is clearly under way, just to "get even."

The solutions to these two situations are quite simple. Some reasonability checks could certainly be built into Peco's billing algorithms, especially important because major departures from the norm could be indicative of dangerous gas leaks.

(Continued on Page 34)

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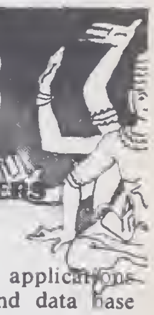

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Software House Suffers $750,000 Loss in Blaze

By Bruce Hoard
CW Staff

HUNTSVILLE, Ala. — When General Computer Services, (GCS) Inc.'s facilities at the Huntsville Industrial Center went up in flames around 6 a.m. on Feb. 19, all documentation, company records and corporate information were destroyed. The estimated loss: $750,000.

Despite that catastrophe and the task of recovering from it, GCS, a software development house, has not lost a customer.

Fortunately for GCS, it also did not lose most of its software programs because of a backup system housed with its remote processing vendor, Cars, Inc. of Birmingham, Ala. Two programs were at least partially destroyed, however, and GCS President Tom Keown said there were some costly losses.

Fire Ravaging General Computer Services, Inc.

"I guess we'll survive," he said when queried about insurance coverage, "but obviously there will be some loss."

That loss includes 40% of a redocumented but not reprinted on-line mortgage loan accounting system and all of a payroll personnel system representing what Keown estimated at five man-years and $200,000. The payroll system was not a total loss in the sense that the original, unimproved version was preserved at Cars.

GCS hardware losses included a Paradyne Corp. PICS II channel-to-channel communications processor, a Sycor, Inc. minicomputer and several IBM peripheral devices. Keown said that these have been replaced.

In fact, he continued, GCS received a "super response" from its hardware vendors, who resupplied the stricken company within 10 days. The biggest problems were getting voice and communications lines restored, which Keown said took place 10 days after the hardware was installed.

Keown called the entire disaster a learning process for him and said he would include different provisions in future disaster planning.

"We thought about our software products, but not the mundane day-to-day things like documentation," he said. He added that a lot of routine operations instructions had been lost, and GCS was finding it difficult to replace them.

One of the problems in that area is the fact that documentation is only updated twice a year while software is updated weekly. GCS is now turning to customers who have received recent shipments in an effort to replace lost documentation. In the future, Keown said that all documentation would be more thoroughly backed up.

Because GCS had 15 payrolls to do the day of the fire, some quick and innovative thinking was called for.

At approximately 10 a.m., telephone conferences were arranged with various managers in the company, and four operating units were established at four individual employees' homes. The employees immediately began to call GCS customers and inform them of the situation and that work would continue on payroll processing and software maintenance.

A customer who had just changed banks but not closed out his old account was contacted. He agreed to transfer the use of the account to GCS and also permitted the company to use his payroll checks, as all of GCS' had been destroyed.

GCS then proceeded to use the borrowed account and checks to pay some 40 companies during the next two weeks.

There were other inconveniences. With no remote computing capability, some employees had to relocate at the Cars center while others continued their systems work at various customer sites.

According to Keown, rebuilding has been difficult, but is coming along despite the fact that a lot of things, including the phone system, are "still kind of screwed up."

He knew things were far from perfect when the company's new sign arrived and the word "computer" was misspelled on it. "You can't take anything for granted," he said. "Anything that can go wrong will."

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"I've always felt," Wood continued, *"that one of the strongest tests of the usefulness of a system is how well it can accommodate change. In the two years we've been using IFPS, we've undergone a corporate reorganization and a conversion of accounting methods. IFPS helped us keep pace with it all.*

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DP Design Goofs Seen Avoidable

(Continued from Page 31)

As for the copier company's system, usage estimates should be flagged as estimates (Peco does this when the meter reader cannot gain admittance to read the meter), and estimates should be somewhat close to actual usage.

Poor Systems Design

Computers are supposed to improve the quality of life, not complicate it. Instead, more and more systems are being designed to minimize human involvement. If the systems were designed better, such a change could be beneficial; instead, it seems the design of many such systems does not deal even with likely anomalies.

The blame for the resultant complications is usually placed on the poor computer. Those of us in the industry, however, know the error is almost invariably poor systems design.

With the advent of large data base systems in the offing — not to mention electronic funds transfer, office automation and a host of yet-to-come microcomputer applications — we must do something about improving systems design.

The popularizations of structured walkthroughs is a step in the right direction, as long as the technique is properly employed. Don't just step through the logic represented on the system flowcharts. Ask "what if" questions, with no bounds on the rest of the questions.

Several design groups I have worked with have gotten quite upset by such questions as invalid data input values (that can't happen), missing values (the system will catch it before here) and invalid fields.

Ask these questions. You may not be popular at first, but the systems that result will be the better for such analyses.

Robinson is an independent consultant operating as S.L. Robinson & Associates in Morrisville, Pa.

[Copyright 1980
Stephen L. Robinson]

Jacquard Revises 'Account-Rite'

SANTA MONICA, Calif. — AM Jacquard Systems has released a revised version of its Account-Rite payroll package designed for Jacquard's J100 shared-logic and J500 stand-alone minicomputers.

The revised Account-Rite features automatic payroll generation for salaried employees, eliminating the need to enter repetitive information each pay period.

Other features include multistate tax capabilities with a provision for city and special taxes; calculations for comprehensive incentive bonuses along with posting; and general ledger functions.

The revised Account-Rite with manuals is offered free to current Jacquard customers. The package costs $400 for first-time users or for duplicate packages, the vendor said from 1900 Ave. of the Stars, Los Angeles, Calif. 90067.

Data Directions Offers 'Trustpac' Turnkey

BLOOMFIELD, Conn. — .Designed for small and medium-size trust departments, a modular trust automation system is being offered by Data Directions, Inc.

Trustpac runs on Data General Corp. CS/40, 50 and 60 minicomputers and requires a 64K-byte processor. Targeted for nontechnical personnel, the interactive system allows users to edit data on a field-by-field basis, the vendor said.

A tickler file is included in the system. After an account is given a tickler number and a frequency, it may be scanned .for upcoming transactions as frequently as needed, according to the vendor.

Trustpac's information storage and retrieval system performs account and asset file maintenance. Computer-generated asset entry cards entered in a batch mode reportedly make it possible to move from one part of a trust to another or to indicate potential purchases and sales.

Trustpac also tracks daily transactions and keeps a daily transaction journal, maintains trial balances and supplies a statement of condition as necessary.

Trustpac costs $25,000, with maintenance after the first year available for 8% to 10% of the purchase price.

Sixteen supplemental modules are available as options, including Automated Fees, Dividend Map (Anticipated Income Report) and Common Trust Fund Accounting. These range in price from $200 to $500, depending on their complexity.

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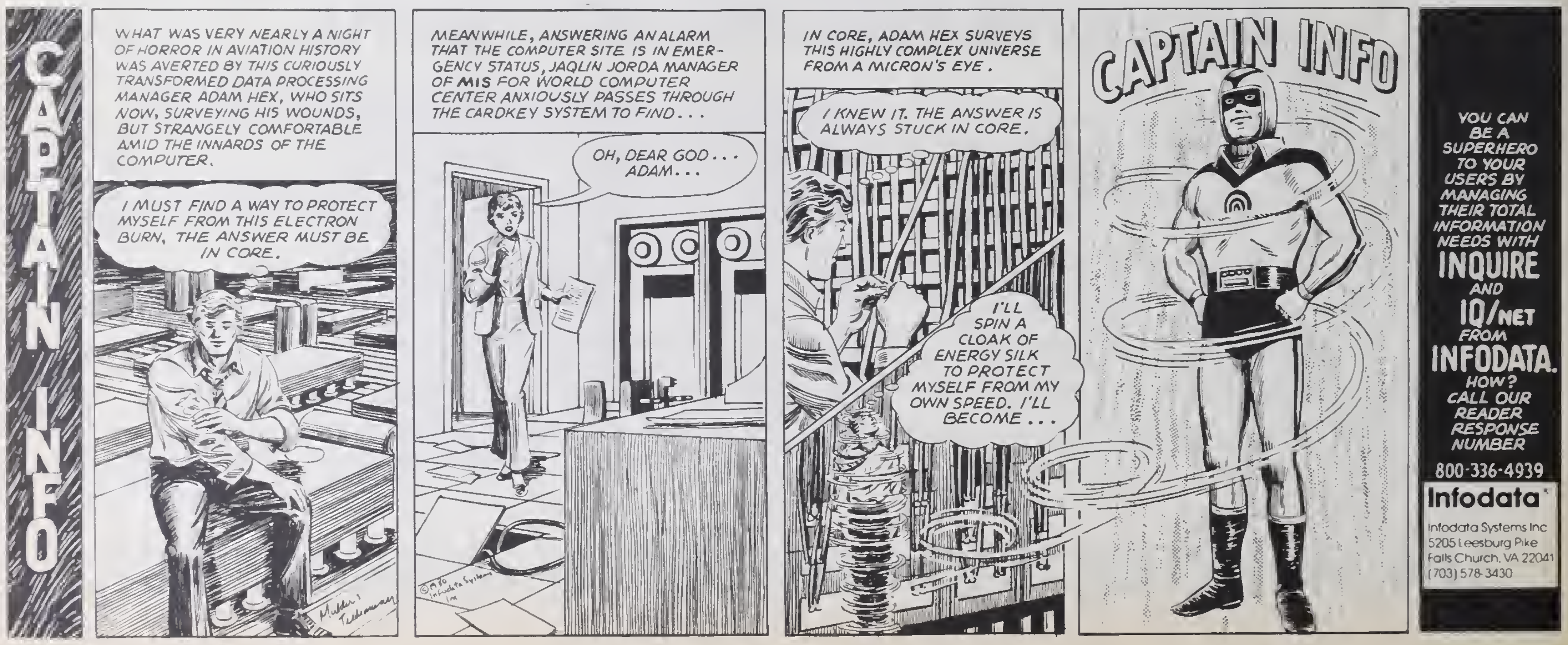
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Via Communications Software

HP 3000s, IBM CPUs Get On-Line Link

By Jeffry Beeler
CW West Coast Bureau

CUPERTINO, Calif. — Hewlett-Packard Co. 3000 series minicomputer systems can now communicate interactively with IBM or IBM-compatible mainframes, thanks to the introduction of an HP communications software package.

Christened the Interactive Mainframe Link/3000 (IML/3000), the package reportedly allows Model 3000 Series II and III systems to interact with IBM 370, 30 series, 4300 or compatible processors through the 3270 communications protocol.

The announcement of IML/3000 adds another dimension to HP 3000-based communications capabilities, a company spokesman explained. Until recently, 3000 series systems could interact with IBM mainframes in batch mode only. Now, with IML/3000, the HP minis and IBM's large-scale CPUs can communicate in on-line mode as well.

HP credits its latest communications software package with easing the transition from centralized to distributed processing by allowing users to off-load their teleprocessing functions from their host mainframes to their HP 3000 processors.

Two Main Modes

IML/3000 reportedly operates in two main modes: the programmatic-access-and-update mode and the inquiry-and-development-facility (IDF) mode.

In the first mode, the software package allows high-level language programs in an HP 3000 to interactively update and gain access to any CICS and IMS data base in an IBM host mainframe, the spokesman said.

IML/3000 supports user programs written in Cobol, Fortran, Basic and HP's Systems Programming Language, and it connects Model 3000 processors to their IBM hosts through standard access methods like Btam and Tcam.

In the IDF mode, the package allows an HP 2640 series block-mode terminal, when operating locally in an HP 3000 system, to act as if it were an IBM 3270 terminal linked directly to a host mainframe.

The IDF facility is intended primarily for those occasional applications when operators of 2640-type terminals prefer to communicate directly with their host mainframes and gain access to CICS, IMS or TSO programs without having to go first through their local HP 3000s, the spokesman said.

IML/3000 reportedly simplifies communications between HP

(Continued on Page 36)

Processor Switches at 130 Packet/Sec

CAMBRIDGE, Mass. — A full-duplex packet-switch processor that moves packets of 1,008 bits or less at speeds faster than 130 packet/sec is available from BBN Computer Corp.

Full-duplex host throughput tops 200 packet/sec, according to a spokesman for the subsidiary of Bolt, Beranek and Newman, Inc.

The Model C/30 processor can handle up to four host CPUs, six lines to other network nodes and 64 terminals, the spokesman said. The C/30 works either as a primary packet processor in a small network or as a node in a larger network.

With the C/30, users need not reserve communications lines to preallocate them to specific terminals or hosts. Instead, the spokesman stated, each packet is sent automatically via the shortest path available at the time.

Known as adaptive routing, this technique "greatly reduces line costs and allows the network to bypass failed nodes automatically," he said.

Arpanet-Compatible Software

The processor can drive BBN Computer's interface message processor (IMP) program, which opens a packet-switch node for 56K bit/sec transmission and is compatible with the Defense Department's Arpanet.

Another program called terminal interface processor (TIP) supports both host and terminals.

TIP has all the features of IMP plus it supports up to 63 terminals at speeds in the 50- to 19.2K bit/sec range, the spokesman explained.

The software supporting the C/30 has reportedly been running for more than a decade on Arpanet, which is said to be the world's largest packet-switch network. The programs take "advantage of the fact that not all terminals transmit at once," the spokesman said.

Packets, even from the same message, can run on different paths. And packets from different nodes are interleaved to maiximize line use so that 80% of the line bandwidth carries useful data, the spokesman continued.

A copy of each packet is always kept with the previous node in the route until acknowledged.

Besides monitoring network status, gathering statistics and performing on-line testing, IMP segments host messages in packets; receives, routes and transmits store-and-forward packets; and retransmits unacknowledged packets.

IMP also reassembles packets into messages for transmission to a host.

The host CPU can send the

(Continued on Page 42)

Packet Nets Need New Encryption Tools

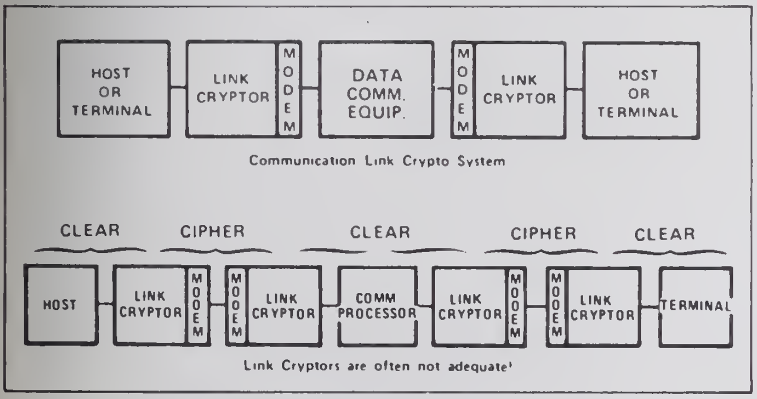

Figure 1. Link Crypto System

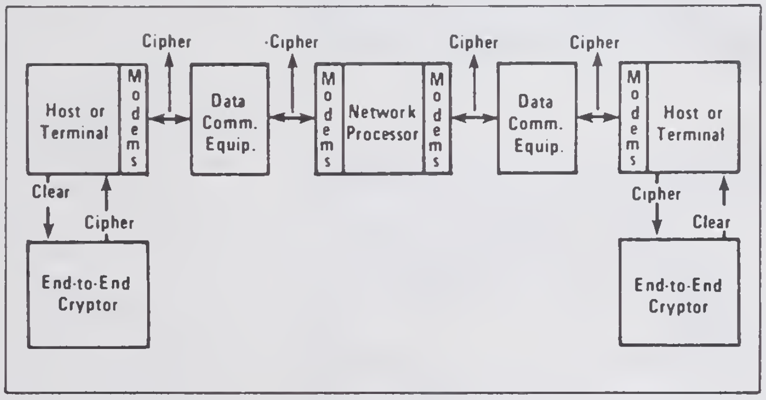

Figure 2. End-to-End Crypto System

By Jim Nelson
And David Reisman
Special to CW

The new communications technology poses a grave security threat and gives users a strong incentive to encrypt digital traffic.

Advances in technology and changing sociological expectations are causing new security requirements to evolve in the DP and telecommunications arenas of many nations.

Major technological changes are occurring in the implementation of public and private data networks because of the recent availability of lower cost computers along with a higher cost of communications lines.

This is resulting in the development of computer-controlled packet switched networks that are three to 100 times more efficient than earlier circuit-switching techniques in reducing the waste of available bandwidth resources.

Previously, a communications company or agency established an analog circuit for a subscriber and then passively amplified signals until the circuit was terminated.

In tomorrow's packet network environment, the communications company or Post, Telephone and Telegraph (PTT) utility will actively examine every bit of the transmitted digital message to determine address and route and to perform error checking of each bit at each link over which the message is transmitted.

Since the information in the public or private data network must be regenerated at each link by some computing element, and since the computing element has a program which may be modified, there is the ever-present danger that, through covert techniques, selected messages could be subjected to either disclosure and analysis or message addition, deletion, modification or replay.

> *"While link cryptors are perfectly adequate for circuit-switching environments, they provide little security when used in the new technology of packet-switching networks."*

Further, because message formats will be better specified and standardized, tapping of communications lines and extracting only data of interest will also be simplified.

The revolution in packet net-

(Continued on Page 40)

Reduces Transmission Costs

ITT Branch Introduces Net for Facsimile Units

By Connie Winkler
CW Staff

NEW YORK — Domestic Transmissions Systems, Inc. (DTS), a subsidiary of ITT, has introduced a data communications network called Faxpak for facsimile machines.

Because facsimile machines are probably the "dumbest" of all terminals and typically incompatible, Faxpak reportedly depends on sophisticated emulation software in a patented front-end processor, which took ITT three years to develop.

The processor allows any manufacturer's facsimile (or telecopier) machine to communicate with any other machine over the Faxpak network, according to Thomas F. Murawski, vice-president and director of engineering for DTS.

DTS said Faxpak distance-insensitive rates are less than long-distance phone call rates in most cases.

'Boon for Electronic Mail'

Faxpak, so far a $40 million investment, is basically a digital, packet-switched, store-and-forward message service which ITT marketing executives said could be a boon for electronic mail in the 1980s.

The network is different in that message packets are switched on a "best available route" basis, packet by packet. Murawski distinguished this from the virtual circuit method, which switches an entire transmission.

The Faxpak message-switching computer system headquartered here runs on two Modcomp Systems minicomputers with Wangco, Inc. tape and Memorex Corp. disks. One of the Modcomps is on-line and the second is in what Murawski calls "warm standby" in case the on-line system fails.

This allows real cost savings, Murawski added. If the on-line system cannot accept more messages, the customer is asked to try the connection again.

The front-end processors are at Faxpak originating nodes in New York, Washington, D.C., Atlanta, Houston, Chicago and Los Angeles. Customers call either these nodes or one of 64 DTS locations.

At the originating node the analog facsimile transmission is digitized and sent in packets on the Faxpak network, which uses a combination of AT&T's Digital Data Service (DDS) and ITT's U.S. Transmission Systems (USTS), Murawski said.

Although DTS is giving 90 days free service through June 30 for first users, Faxpak reception has been less than expected, sales executives said. There are more than 200,000 facsimile terminals in the U.S. and about 2,000 from 400 customers are on the Faxpak network.

Planned Capabilities

Currently Faxpak handles only the slower four- and six-minute facsimile machines (about 70% of the facsimile market), but DTS expects to add the three-minute machines to the network by third-quarter 1980.

Faxpak capabilities also planned for 1980 include interface with teleprinter and word processing units and, by 1981, with hard-copy data terminals. Faxpak will also accept input from 300 bit/sec Ascii terminals.

"Facsimile transmission is the least expensive way to use electronic mail," William S. Wheatley Jr., vice-president and general manager of DTS, said about the investment in Faxpak.

Wheatley cited rate comparisons for a seven-minute Faxpak business-hours call between New York and Los Angeles of $2.24 for "urgent" service (within 15 minutes) and $1.40 for "quick" service (within two hours) vs. $2.82 for the same call over the toll telephone network that facsimiles usually use.

Unlike usual facsimile transmission, the Faxpak processor allows multidistribution of the same transmission to several locations.

Faxpak handles facsimiles from Alden, Graphic Sciences, Qwip Systems, Stewart-Warner Datafax Corp., 3M Co., Xerox Corp., Panafax Corp. and Rapicom.

DTS is located at 2 Broadway, New York, N.Y. 10004.

HP 3000s Linked To IBM CPUs

(Continued from Page 35)

3000 programs and mainframe applications by providing a set of 14 high-level programming statements that HP calls "intrinsics."

With these 14 statements, the software package automatically performs all low-level screen decoding and thus frees programmers to devote their full attention to high-level tasks like application development, the spokesman explained.

As a further aid to program development, the intrinsics in IML/3000 can reportedly be used with the intrinsics in both HP's Image/3000 data base management system and the company's V/3000 forms-handling language.

Intelligent Net Processor

Most of the IML/3000 software is downloaded into an intelligent network processor (INP) whose main purpose is to relieve HP 3000s of their line-handling functions. HP describes the INP as a front-end processor incorporating a 16-bit silicon-on-sapphire microprocessor and 32K bytes of random-access memory.

IML/3000 comes with four days of on-site customer training and consultation by a qualified HP systems engineer. The instruction covers development of IML/3000 applications, management of the IML/3000 subsystem, security considerations and use of IDF.

The training and consulting package costs $3,800, compared with $4,500 for the INP. IML/3000 itself, meanwhile, lists for $3,500, excluding a $125/mo fee for support.

Shipments of IML/3000 are slated to begin in May from HP at 1507 Page Mill Road, Palo Alto, Calif. 94303.

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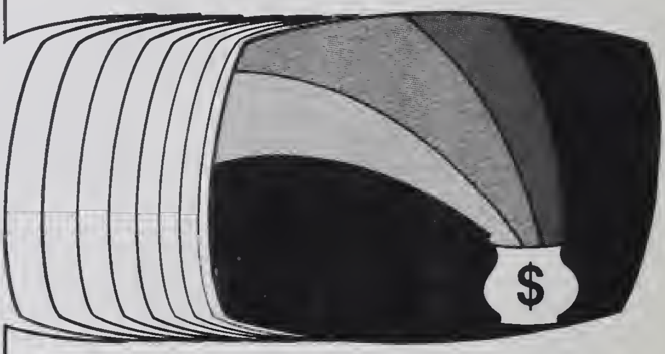

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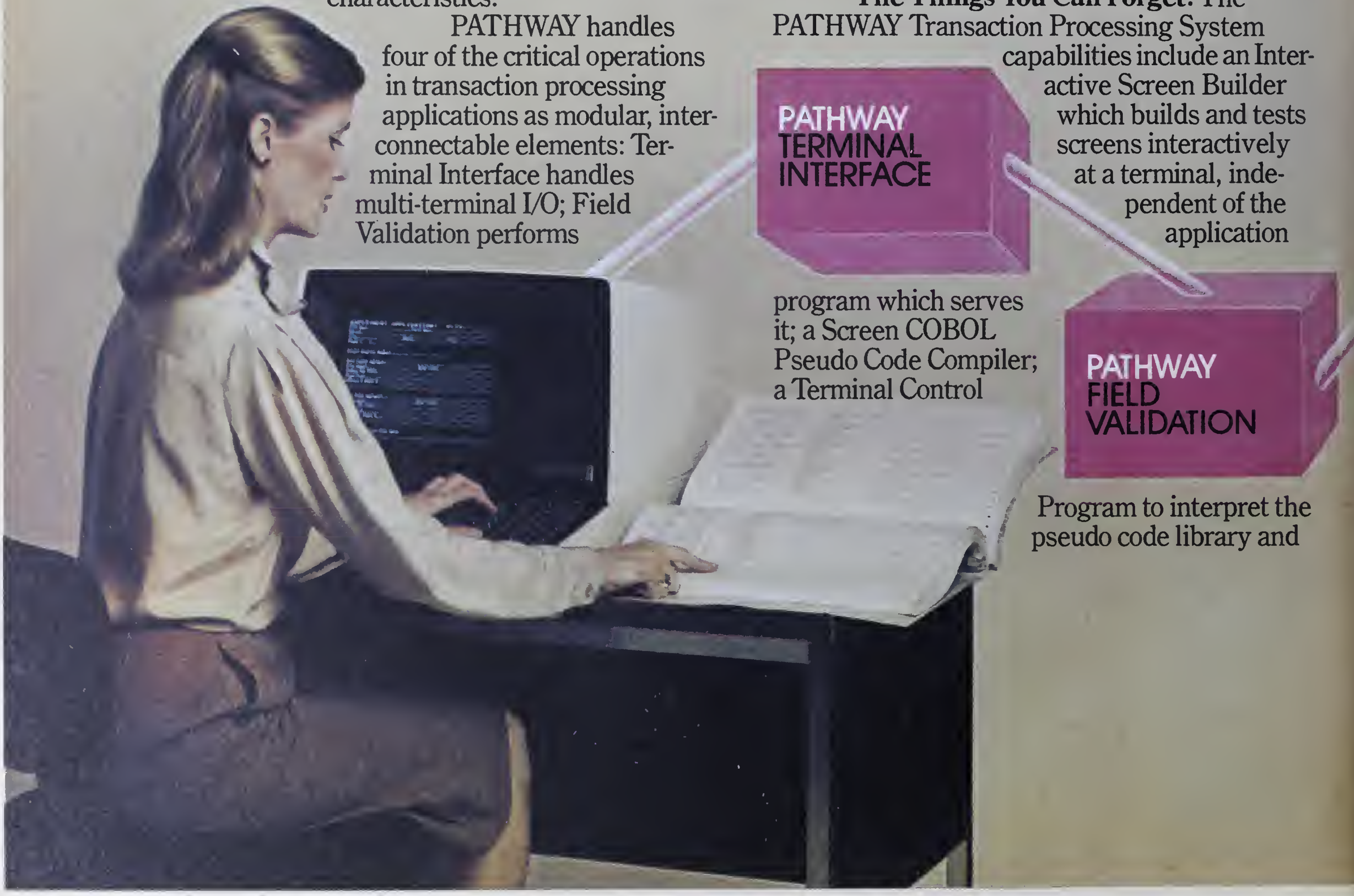

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check the flow and content internally; the Applications Monitor which has power to create, track and alter the application run time environment; and finally the Application Monitor Control Language which lets an operator communicate with an active Application Monitor. It's a powerful system, easy to use and inexpensive. With everything you need to get your on-line transaction applications up and running, with all the benefits of a NonStop™ System, in record time.

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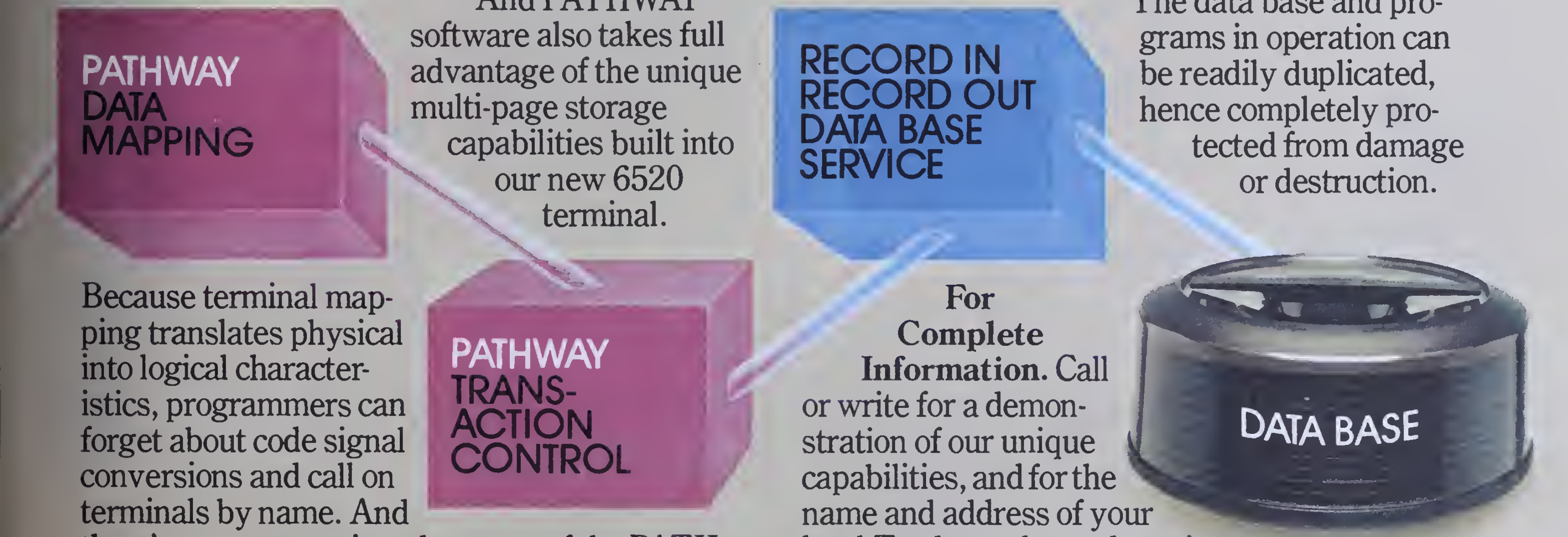

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Packet Nets Give Strong Incentive to Encrypt

(Continued from Page 35)

work technology that is causing a security threat cannot be readily met with older crypto technology. For example, the link-crypting device (or keyset generator) will no longer provide protection over a total communications path.

A link cryptor (see Figure 1 on Page 35) is a device interposed between a terminal or host, known as data terminating equipment (DTE), and a modem, known in this context as data circuit terminating equipment (DCE).

Previously, such devices were adequate to secure information through a total communications circuit, once that circuit was established.

However, packet networks are made of multiple links and, because message header information must be examined at each link's terminus to determine destination and routing, the data must be deciphered between each link.

Technically, the network control mechanism is not supposed to be concerned with the content of a message in the packet environment, but the data is clearly exposed in the clear after each link is traversed.

Consequently, while link cryptors are perfectly adequate for circuit-switching environments, they provide little security when used in the new technology of packet-switching networks.

In order to achieve communications security in the new packet technology, it will be necessary to have the network encipher the data on an end-to-end basis (see Figure 2 on Page 35), or alternately to provide an encryption function in the hosts and terminals.

Where to Encrypt?

If data is enciphered by a host software package (or hardware implementation), then the data must be transformed into any character of the communication character set being transmitted.

If special characters, such as an end of text (ETX) or start of text (STX), are used by the network's communications protocol, then a data character may be transformed by encryption into a control character, which causes an unwanted communications function.

Hence, only transparent protocols such as High-level Data Link Control (LC) may be used when enciphered data is transmitted in an end-to-end manner across a network.

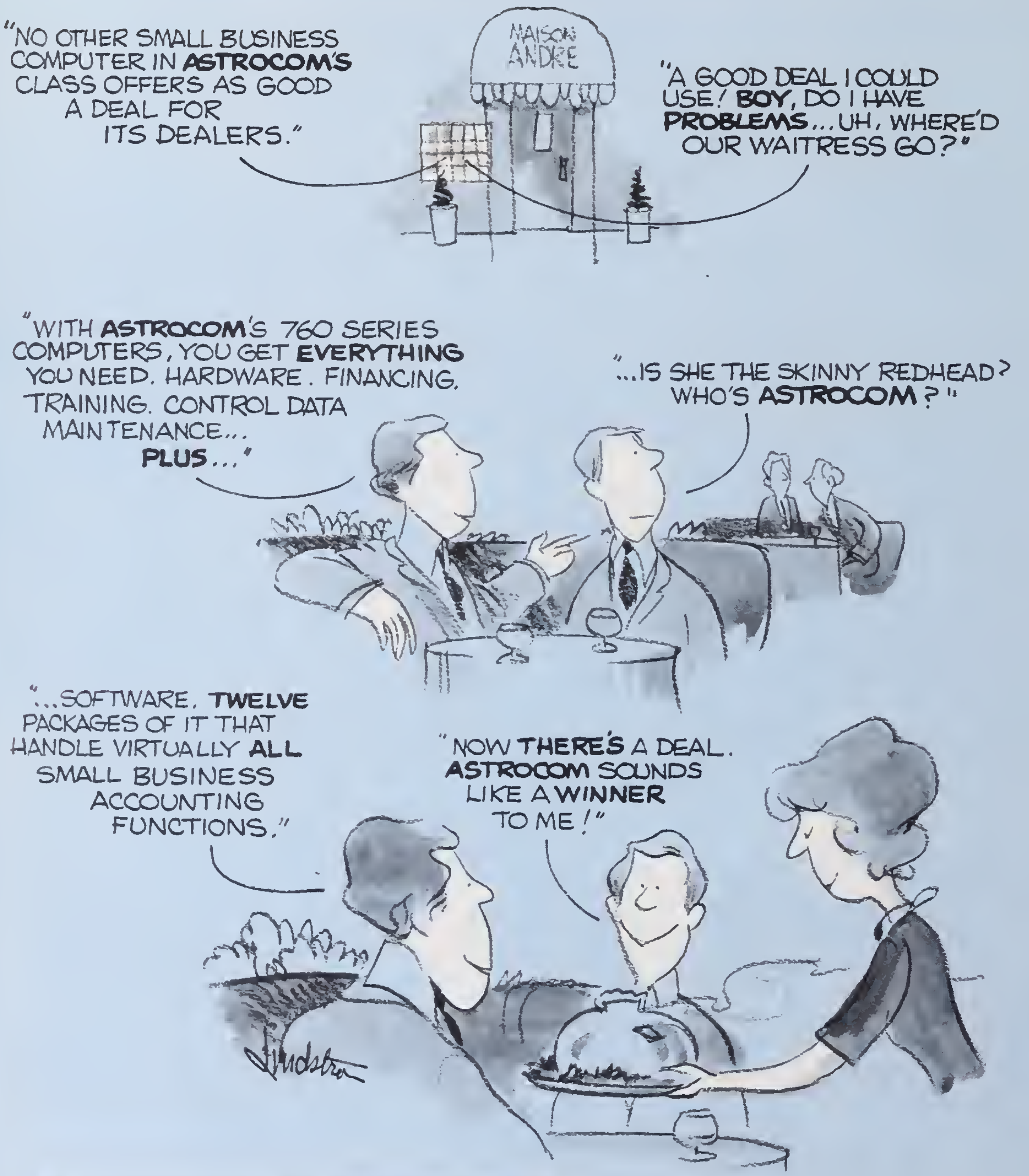
Moreover, all elements of host software must treat the enciphered text as transparent data and pass through it without taking any action based on the data's "meaning." Unfortunately, almost no host software system treats data transparently in today's software implementations.

This article and the adjacent one on Page 41 were adapted with the authors' permission from "Consideration of Privacy and Encryption in Personal, National and Multinational Communications," a contribution to the proceedings of Pacific Telecommunications Conference '80.

The terminals (or remote concentrators) used for end-to-end crypting must be intelligent or must be augmented to provide the necessary intelligence to manage the crypting function and implement the necessary protocols to provide crypto key management.

Although end-to-end crypto systems for use with packet networks are becoming available, several years will be required to produce standards to assure interoperability between the many possible systems and users.

Nelson is program manager of cryptosystems for Univac and figures prominently in current efforts to develop commercial encryption standards. Reisman is a senior attorney with Univac who specializes in matters of privacy and security.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Terminal Takes Alpha Inputs

CEDAR RAPIDS, Iowa — A remote hand-held data entry terminal that accepts alpha as well as numeric character inputs has been introduced by Norand Corp.

The 101 Alpha-1 allows the user to spell out entries rather than having to use numeric codes or equivalents on a 39-key keyboard. The unit has a 16-char. alphanumeric display, a 32K-byte storage capacity and a 12K-byte program storage capacity.

The terminal measures 1.5 in. by 3.3 in. by 8.75 in. and weighs 1.75 pounds. Cost is $1,600.

Norand is located at 550 Second St., S.E., Cedar Rapids, Iowa 52401.

WHO'S STAN?

NATIONAL COMPUTER →

See Page 7
MAYBE YOU'LL KNOW.

Transborder Data Barriers May Restrict Encryption

By Jim Nelson
And David Reisman
Special to CW

Encryption will be required to safeguard information in the new packet networks because of their vulnerability to tapping and misuse. Encryption may also be used to safeguard data bank files for purposes of protecting private or corporate records.

However, some nations have effected legislation that, while purporting to address the privacy of individuals, actually impedes the free flow of information across national borders.

These barriers to transborder data flow may greatly restrict the use of encryption by requiring users to present government "privacy administrators" with copies of enciphered data together with the crypto keys necessary to decipher that data.

Except for perhaps the nation's armed forces, there will be no more powerful position in government than that of the data bank privacy and security administrator, unless an adequate system of checks and balances is built into the system.

The legislation that bears on these matters, such as the U.S. Privacy Act of 1974 and West Germany's Data Security Law, are a consequence of growing concern that the "power" of personal information may be abused.

Centralized Authorities

The approach of European civil law has led to omnibus legislation establishing centralized control authorities in both public and private sectors. Thus, in countries like Sweden and West Germany, there is a compulsory registration of all types of personal filing systems, with limitations on the types of data that files may hold.

Such systems require the existence of a centralized information agency (see Figure 1), which acts as the ruling body responding to applications for private data files. It also requires that special applications be made where personal privacy information is to be transmitted outside national borders.

The centralized information agency investigates alleged violations of data privacy and may provoke prosecutions that can result in fines or imprisonment for transgressors.

In some countries, users may be required to give the agency access to encrypted files and the keys necessary to decrypt those files for some specified time period.

Decentralized Control

As practiced in the U.S. and other countries, decentralized privacy control (see Figure 2) requires that public notice be given of the existence of a personal data file.

In such nations, it is the individual's responsibility to maintain awareness and move to enforce his rights should he suspect violations.

Clearly, encryption cannot be used to meet privacy law requirements concerning the accuracy of data or limiting the types of data which may be maintained in data banks. However, encryption can be used to limit access to a data bank and to ensure its integrity.

While corporations will doubtless employ encryption techniques in securing data within their own national borders, privacy legislation may limit commercial use of encryption to secure transborder data flows.

For multinational companies seeking to invest in foreign countries, the legal barriers and the costs of transborder data flow can be critical in determining whether and how to implement data communications in each nation.

It may be necessary to transmit information by means of courier and tape, rather than the normally more expeditious method of encrypted telecommunications.

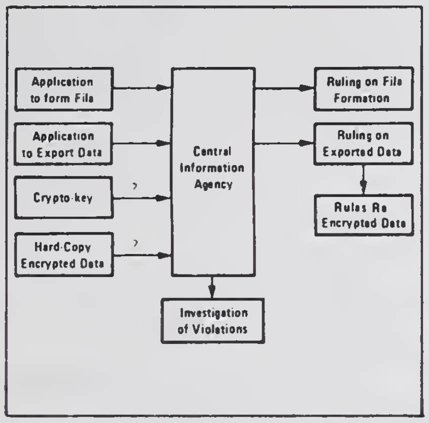

Figure 1. Centralized Privacy Control. Some nations require that, for a specified time period, users give a central information agency the crypto-keys to their encrypted files.

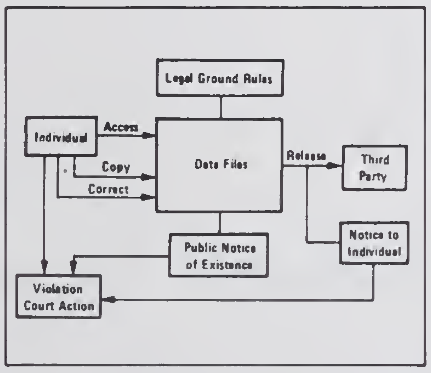

Figure 2. Decentralized Privacy Control. The U.S. and some other countries require users to give the public notice when files of personal information are established. The individual may inspect private files of which he is the subject and may have courts enforce his right to have any errors in those files corrected or to insert his own version of "subjective data."

Guide Details Communications

NEW YORK — A 48-page reference book on *Professional Management via Telecommunications* has been published for the communications professional by The Telecom Library, Inc.

Harry Newton, the book's author and president of the Telecom Library, covers topics ranging from specifying telephone systems to planning communications systems. The book is organized in 11 sections to aid those who have to assess new products and services to manage communications costs.

The sections include "The Future," "Language," "Career Paths," "Telephone Marketing," "Disasters," "Telecommunications Market" and "Communications Management." Cost is $7.50 plus shipping from Telecom Library, Inc., 205 W. 19 St., New York, N.Y. 10011.

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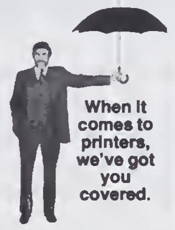
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Study Details Dispute Over Net Architectures

SAN JOSE, Calif. — The upcoming battle between proponents of Open System Architecture (OSA) and proprietary architecture in computer networks is the object of a recent study by Strategic Business Services, Inc.

The interests of the International Standards Organization, which promotes OSA, and the network trend-setters — such as IBM and Digital Equipment Corp. with their "exclusivist" network architectures — are not similar, according to the report, called *Networking Strategies and Conflicts of the 1980's.*

"The manufacturers' strategy is designed to facilitate communications among users of similar equipment, while the work of the ISO is concentrated on insuring that all of the equipment of all manufacturers can communicate with each other."

OSA Model

But while users would probably prefer the Open System Architecture to complement their existing mixes of equipment, the report contends that "ISO has not fully defined the OSA.

"Although we know that it is conceptually similar to IBM's System Network Architecture (SNA) and to DEC's Decnet approach, we also know that the higher levels of the OSA model have yet to be defined."

As a result, if either of those two vendors' systems is chosen, the users "will be confined to communications using only the protocol defined by the manufacturer."

On the other hand, if the ISO/OSA architecture is chosen, users will be forced to define their own high-level end-to-end procedures, which may be incompatible with other future procedures.

The report discusses the existing and foreseeable communications environment, price trends, the most promising merging technologies and which technologies are likely to win user approval. It also describes services which will be offered in the future.

The report costs $1,500 and can be ordered from Strategic Business Services, Inc., Suite 215, 4320 Stevens Creek Road, San Jose, Calif. 95129.

McGraw-Hill References Communications Devices

NEW YORK — A guide to data communications devices, including modems, acoustic couplers and port selectors, was published this month by McGraw-Hill Book Co.

The guide describes how to obtain the equipment and details the technical specifications of more than 30 different devices. It offers a format for competitive solicitations, includes sample document clauses and forms and checklists of specifications for both general and specific devices — all to aid in developing a set of component requirements.

Written by Gilbert Held, chief of data communications for the U.S. Office of Personnel Management, the 150-page book costs $24.50.

McGraw-Hill is located at 1221 Ave. of the Americas, New York, N.Y. 10020.

Packet-Switch Processor Debuts

(Continued from Page 35)

IMP a message up to 8,095 bits long, the spokesman pointed out. When a packet is received at each IMP, it sends an acknowledgment back to the previous IMP. Because packets are dynamically routed, they may arrive at the IMP out of order.

The C/30 is a microprogrammable 20-bit computer system with a 32-bit microword length, the spokesman noted.

The system's basic chassis supports four cards: two CPU and memory cards and two I/O cards. An optional expanded chassis that supports eight cards is also available.

Micromemory is expandable to 8K words, and main memory is expandable to 512K words, the spokesman added.

The C/30 costs less than $25,000. BBN Computer is located at 33 Moulton St., Cambridge, Mass. 02238.

Packet-Switch System Handles Up to 18 Hosts

CAMBRIDGE, Mass. — Besides the C/30 packet-switch processor, BBN Computer Corp. unwrapped another Arpanet-compatible system comprised of two, four, six or eight CPUs.

The Pluribus system was originally developed to provide a reliable, modular packet-switch node for the Arpanet, a spokesman said.

But the system is aimed at virtually any network environment with a large number of host mainframes and/or terminals.

A dual-processor Pluribus configuration reportedly supports six hosts and three lines. With four internal CPUs, the system handles 12 hosts and six lines, the spokesman continued.

As many as 18 hosts and 10 lines are supported by the six- and eight-processor versions.

Further, Pluribus supports 64 to 192 terminals and has a line throughput in the 240- to 760 packet/sec range for packets of 1,008 bit or less.

Component Equality

The multiprocessor, multibus architecture ensures system reliability by emphasizing component equality, the spokesman claimed. All internal processors are functionally identical.

The system's full power is concentrated on the part of the algorithm that is busiest at any given time and, because no processors are specialized, no one part of the system will form bottlenecks while other parts are lightly loaded, the spokesman continued.

Each Pluribus processor has access to its own private memory and to a common memory of up to 1,008K words.

A given processor can address up to 16K words of private memory, which would contain the routines most frequently referenced.

This private memory scheme is said to reduce competition for shared memory among the internal processors.

Pluribus costs $130,000 for a minimum configuration.

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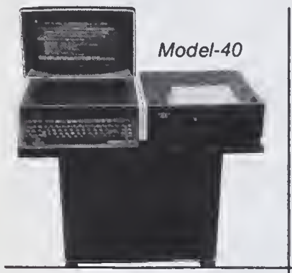
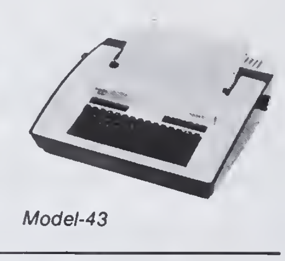
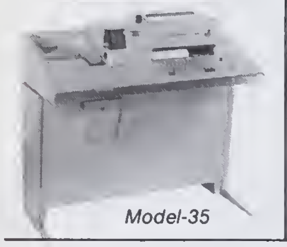


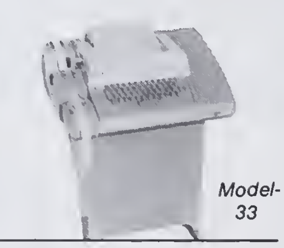
Model-40



Model-43



Model-35



Model-33

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IBM Adds 12 More Models of the 3850

WHITE PLAINS, N.Y. — IBM has announced 12 additional models of its 3850 mass storage system that reportedly can lower the monthly cost of 1M-byte increments of mass data storage to less than 2 cents each.

The additional models of the 3850 permit expansion by adding "storage extension frames" — data extension frames without separate control devices, recording devices or power components, a spokesman explained.

Current models of the 3850, which use data extension frames that include storage, control and read/write devices, continue to be available.

Introduced in 1974, the 3850 can be attached to 370/145 through 168 systems, the 3031, 3032 and 3033 processors and the 4341 mainframe operating under VM/370, OS/VS1 and OS/VS2.

Organizations such as financial institutions and insurance companies that must store vast amounts of information on-line for only periodic access would particularly benefit from the latest 3850s, according to the spokesman. For example, a system using a single 3851 mass storage facility can store up to 236 billion characters — the equivalent of a tape library of about 24,000 reels.

Each storage extension frame has a capacity of 67 billion characters. Up to three frames can be attached to a 3851 Model 1 mass storage facility, which contains data control and data record devices and 35 billion characters of storage, the spokesman said. Thus a 3850 mass storage system in its largest configuration with two 3851s, each with three storage frames, can store a total of 472 billion characters of data.

Fist-Sized Cartridges

The 3850 uses fist-sized data cartridges, each capable of storing 50 million characters of information and housed in honeycomb-shaped storage compartments. When a specific file is needed — to update a customer account, for example — the host processor instructs the mass storage system to locate the particular cartridge containing the needed information.

A control unit locates the cartridge in the storage frame and instructs an access device to extract it and move it to a read/write station. After the recording device reads or enters data, the cartridge — with account records intact — is returned to its location in the system, the spokesman said..

The storage extension frame for the 3850 will be available in the second quarter, with the price for each frame set at $19,500. The frames can also be leased for $650/mo on a two-year plan or rented for $764/mo.

A 3850 configuration including one 3851 mass storage facility, a data extension frame, four 3350 disk storage files, controllers and "other requisite features" — for a total of 102 billion characters of storage — can be purchased for $1,132,980, leased for $31,528/mo or rented for $36,273/mo.

By adding one storage extension frame to this configuration — a total of 169 billion characters — the storage increases by two-thirds while the price increases by about 2%, the spokesman said. That configuration carries a purchase price of $1,152,480, a lease price of $32,178/mo and a rental price of $37,037/mo.

Digital Optical Disks Predicted Next Mass Storage Technology

CORONA DEL MAR, Calif. — High-density digital optical disks — providing archival storage, disk backup and possibly electronic filing cabinets — may well be the next mass storage technology, according to the February issue of the "Computer and Data Processor Technology" newsletter from Hobbs Associates here.

While digital optical technology has been around since the 1960s, its high initial cost and the widespread use of magnetic tape storage media have combined to keep it in the background until now, according to the newsletter.

IBM introduced its Model 1360 Photo Digital Storage System in the late '60s. It was based on photographic film chips, but only five systems were installed, largely because of their high cost and inability to change data without writing a new chip, the newsletter pointed out.

Precision Instruments Co. (now Omex, Inc.) was one of the first to use the coherent light of a laser to create and detect microscopic storage elements on a recording surface — first demonstrated in 1963 and implemented in 1972. A modern version, called Stripstore, is slated for delivery by Omex in 1981.

"In the meantime, the consumer market has demanded the video equivalent of a phonograph record — i.e., low-cost storage media that can readily be reproduced to permit viewing 30- to 60-minute TV programs," the article noted. Such consumer interest in TV-related goods of this type may ultimately speed up the development of DP-related systems, Editor L.C. Hobbs noted.

Advantage Over Competition

"Frequently, products in the computer industry that are based on technologies used elsewhere have enjoyed an advantage over competitive products whose development depended entirely upon computer-related requirements," Hobbs said. "This is the case for digital optical disks since large developmental efforts and significant funds are being expended on the development of video

(Continued on Page 50)

Tally Drops Price Of Serial Printer

SEATTLE — Tally Corp. has reduced prices on its Model T-1602 serial printer from $2,645 to $1,995. The 24% reduction is the third major price cut the company has announced recently within its serial printer line.

The latest price reduction is in line with Tally's increased production capacity and its "determination to sizably increase its market share for high-speed serial printers," a company spokesman said.

The T-1602 is a desktop, 132-column impact matrix printer designed for high-volume DP applications. It features a 96-char. upper/lower case character set, self-testing, forms length selecter, forms thickness control, paper out alarm, double-wide character printing and snap-in cartridge inking system.

Tally Corp. is located at 215 Eighth Ave., N. Seattle, Wash. 98109.

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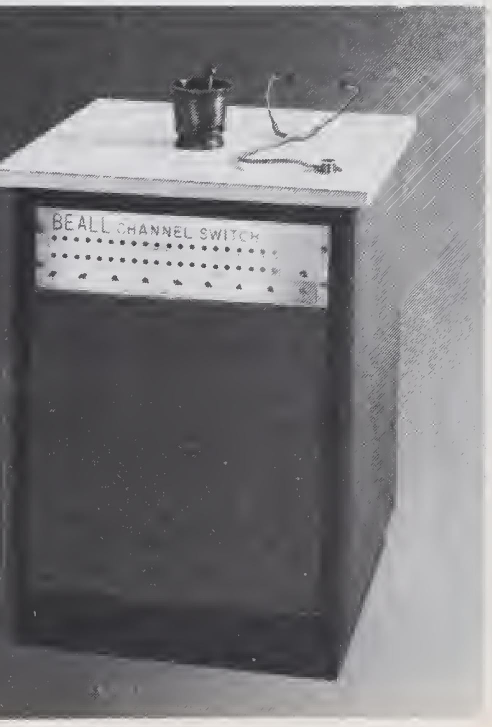

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PMS0254	4.710	4.485	1.05
PMS0354	9.160	8.990	1.02
PMS0454	43.610	43.451	1.00
PMS0554	86.420	86.123	1.00
PMS0664	1.610	1.350	1.19
PMS0764	7.040	6.679	1.05
PMS0864	13.730	13.370	1.03
PMS0964	66.830	66.068	1.01
PMS1064	132.920	129.727	1.02
PMS1124	1.520	1.306	1.16
PMS1234	2.470	2.424	1.02
PMS1324	1.310	1.618	0.81
PMS1407	251.560	37.327	6.74
PMS1507	50.260	57.657	0.87
PMS1674	22.440	23.005	0.98
PMS1724	52.550	53.133	0.99
PMS1807	50.180	34.766	1.44
PMS1907	32.020	34.679	0.92
PMS2007	17.720	20.264	0.87
PMS2107	13.450	20.242	0.66
PMS2202	33.311	26.352	1.26
PMS2324	121.610	137.997	0.88
PMS2402	0.940	0.539	1.74
PMS2502	0.720	0.562	1.28
PMS2624	122.920	227.689	0.54
PMS2708	4.850	0.961	5.05
PMS2809	103.770	0.006	17295.00
PMS2934	0.660	0.414	1.59
PMS3009	0.230	0.006	38.33
PMS3103	0.610	0.398	1.53
PMS3202	4.740	3.923	1.21
PMS3307	2.470	1.959	1.26
PMS3407	39.190	7.774	5.04
PMS3507	5.580	2.587	2.16
PMS3607	156.540	20.077	7.80
PMS3701	4.480	1.621	2.76
PMS3802	4.060	2.874	1.41
PMS3903	6.050	3.864	1.57
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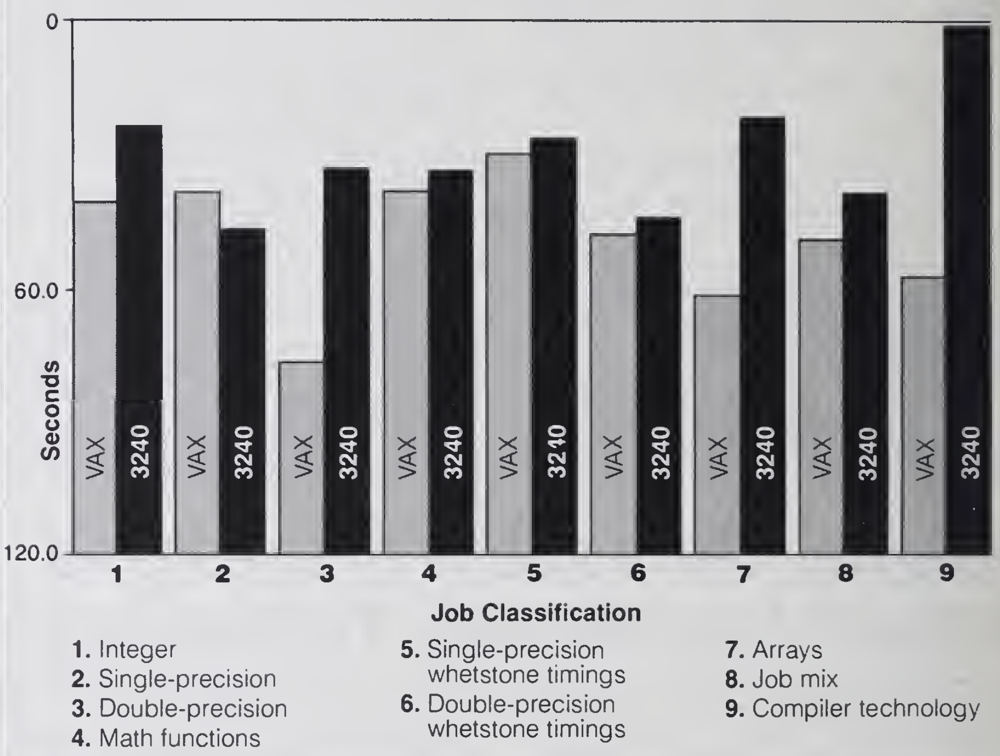
PMS4202	118.490	125.039	0.95
PMS4301	110.650	75.569	1.46
PMS4403	1.990	0.739	2.69
PMS4584	219.990	189.081	1.16
PMS4603	18.640	16.939	1.10
PMS4701	0.350	0.077	4.55
PMS4802	0.830	0.880	0.94
PMS4934	0.340	0.050	6.80
PMS5008	0.430	0.168	2.56
PMS5108	98.950	55.419	1.79
PMS5208	0.900	0.917	0.98
PMS5308	0.330	0.029	11.38
PMS5408	2.080	1.697	1.23
PMS5502	1.130	2.180	0.52
PMS5602	207.140	198.685	1.04
PMS5703	585.170	254.545	2.30
PMS5824	18.740	18.194	1.03

*Performance Ratio = $\frac{\text{VAX 11/780 CPU time}}{\text{Perkin-Elmer 3240 CPU time}}$

2. Perkin-Elmer 3240 vs. VAX* Average Time by Job Classification



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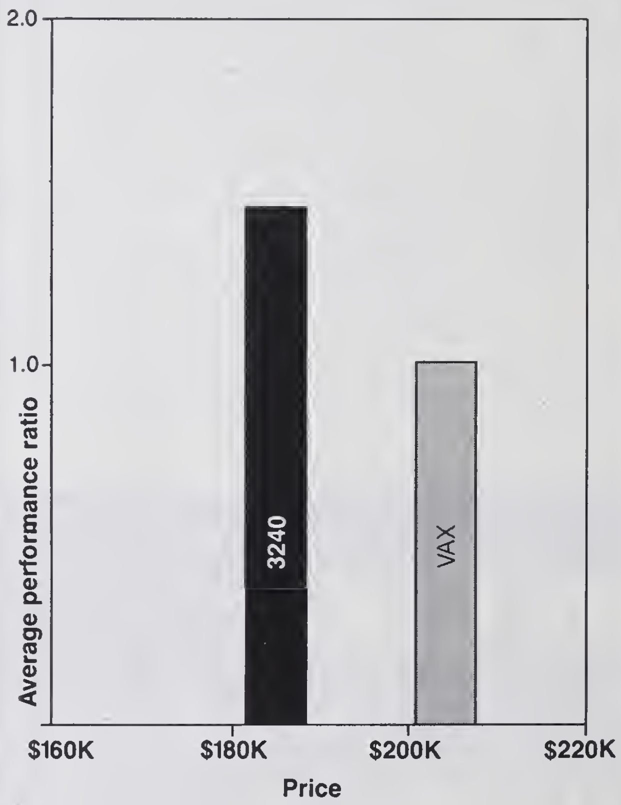

The configurations tested were 2 MB of memory, 67 MB disc, 75 ips tape, Floating Point Processor, CRT terminal, battery backup, and system software. The 3240 had a Writeable Control Store and Fortran Enhancement Package, while the VAX 11/780 had a Floating Point Accelerator.

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PERKIN-ELMER

Installation to Begin This Week

Land-Title Office Testing 'Office of the Future'

By Jeffry Beeler

CW West Coast Bureau

FLORENCE, Ariz. — Organizations have long dreamed of automating their office functions and transferring their records from paper to a more efficient data storage medium. In a small desert community southeast of Phoenix, that dream is about to become a reality.

Early this week, the Pinal County recorder's office here is expected to install an automated paperless file system that will reportedly allow the county to convert its thousands of land-title records from paper to microfiche.

Using relational data base techniques and the latest microprocessor technology, the system will automatically reference each microfiche record and permit it to be retrieved on command from a centralized data bank.

Though originally designed for "automated land-title recordation" only, the system seems destined for a broad range of commercial and government applications. In essence, the system allows users to dispense with most or all of their paper records by enabling the documents to be stored and retrieved in computer-manageable form.

The system could be applied to almost any business or administrative setting, not just to county recorders' offices, according to Charles Simon, one of the system's main designers.

Simon, who serves as managing director of the San Diego-based Management Research Foundation (MRF), views the system as the embodiment of MRF's office-of-the-future philosophy.

"Almost everyone in the computer industry these days is talking about the office of the future, but very few people truly understand what the concept means," Simon explained. "The whole purpose of building office-of-the-future systems is to eliminate paper and filing cabinets."

MRF's original aim in designing a system for county recorders' offices was to cut the U.S.' soaring housing costs by reducing the premiums consumers have to pay to obtain title insurance.

At present, Simon explained, every title-insurance company in the U.S. keeps a title document for every piece of property within its own county. As a result, all the underwriters within a given county maintain exact duplicates of each other's title plants, rather than pooling their records in one central data base.

To cover the heavy expense of maintaining large independent title plants, insurance companies have been forced to keep their policyholders' premiums at artificially high levels.

Hierarchical Data Bases

With MRF's paperless file system, however, Simon and his colleagues propose to eliminate the redundant title documents and consolidate them in hierarchical data bases, one for each county.

The data bases would be maintained by a county recorder's central mini-or microcomputer system, but would remain accessible to the title-insurance companies through remote on-line terminals. By consolidating their title plants in this manner, Simon theorized, underwriters should be able to cut their data storage overhead and pass along the resulting savings to consumers in the form of decreased insurance rates.

Impetus for developing the county recorder's office system came from the Real Estate Settlement Procedures Act of 1974, which calls on the federal government to find ways of cutting housing costs for the average U.S. citizen.

MRF, a nonprofit research organization that specializes in automating the U.S. courts, began designing a standardized land-title registration system in late 1978. About a year later it was named co-recipient of a $500,000 Department of Housing and Urban Development grant to implement a version of the system in Pinal County, where the design was to receive its first test.

As a non profit organization, MRF has no plans to market the system on its own, but will probably name a qualified hardware vendor as its licensed distributor, Simon said.

System Configuration

The version of the system scheduled to be installed this week in Pinal County will incorporate a 128K-byte IBM Series/1 with a 64M-byte Model 4963 hard disk unit, a 13.9M-byte Model 4962 hard disk unit, four Model 4978 and 4979 CRT terminals, a 235 line/min Model 4973 band printer and a 120 char./sec Modeal 4974 matrix printer. As a whole, the system costs an estimated $100,000.

For smaller counties unable to afford such an expensive configuration, Simon and his colleagues have designed a lower cost alternative system built around a 128K-byte Sentinel Computer Corp. Model 50 microcomputer — an Intel Corp. 8086-based machine slated for introduction sometime this week.

Currently nearing the end of its design phase, the Model 50-based system will incorporate at least one 29M-byte hard disk unit and is expected to cost $60,000 to $70,000, Simon said.

Both the Series/1 and Model 50 systems will use the Champion International Corp. operating system and data base language, which is hardware-transferable when equipped with a custom-written translator module.

Disk, Fiche Combination

Both the systems will also use a combination of standard CRT terminals and modified Addressograph-Multigraph Corp. Bruning 95 microfiche display units.

Because a typical land-title registration system holds billions of bytes of on-line data, no county recorder's office could realistically expect to meet all its mass storage needs with disk units alone.

The cost would prove prohibitive, Simon said.

Files on Fiche

In designing its automated paperless file system, therefore, MRF decided to store only the most heavily used land-title data on disk and put the remaining 90% or so of the information on relatively inexpensive microfiche. The disk-stored data would be retrieved through the CRT terminals, the fiche-stored data through the redesigned Addressograph-Multigraph units.

More information about the automated land-title registration system is available from Management Research Foundation, Box 218, Coronado, Calif. 92110.

Datapoint Hikes Prices

SAN ANTONIO, Texas — Datapoint Corp. has announced general price increases on most hardware elements of its computer-based systems.

The increases range from 3% to 8% with an average rise of 4%, according to a company spokesman. For leased units, most prices are up 5% to 14% with an average increase of 8%.

The only products not affected by a purchase price increase are Infoswitch communications management systems and 3800 ARC workstations, the spokesman noted.

Higher hardware and component costs, labor costs and higher money costs associated with operating leases were cited as reasons for the action.

In another recent pricing action, Datapoint increased its customer service maintenance rates from 4% to 10% on systems and 5% to 15% on individual products. Those adjustments became effective March 1 for all new orders and will be effective May 1 for all existing service contracts or on their renewal anniversary date, whichever occurs later.

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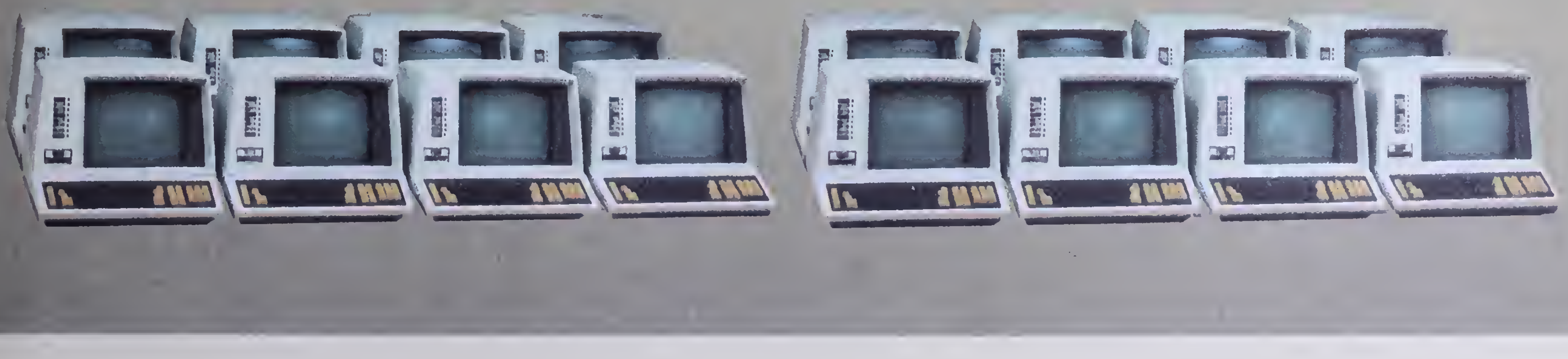

"If the auto industry had done what the computer industry has done in the last 30 years, a Rolls-Royce would cost $2.50 and get 2,000,000 miles per gallon."

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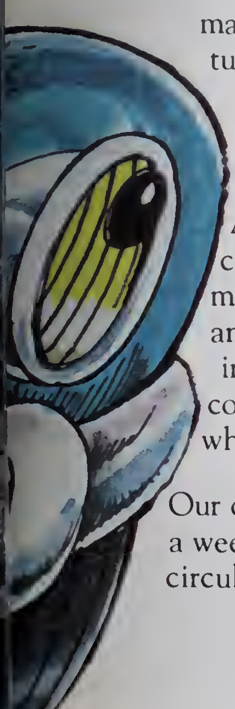
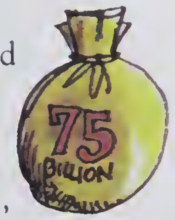
Most of our publications are weekly newspapers, because so many things happen so rapidly in the computer business (as the headline quote from a prominent industry executive makes so clear). In only thirty years the industry has gone from the development of the giant Eniac system, through the tube-powered, water-cooled Univac I (the world's first business computer), to the incredibly cheap, battery-powered microprocessor.

But as unbelievable as the last 30 years have been, the next 30 will probably be even more incredible. Right now, IBM has begun delivery of a new computer series that will, by itself, provide four times as much processing power as all the previous computers delivered by the company. And they have announced a new "superconductor" that could improve computer speed and performance by a factor of 500 in the next seven years! It's hard to remember this is real science, not fiction.



This extraordinary increase in efficiency has led to a rapid expansion in computer use, as human ingenuity finds more and more applications for these powerful tools. So the market for computer products and services has turned out to be more elastic than most observers had thought. Worldwide expenditures are currently at $75 Billion, and growing by 20% a year.



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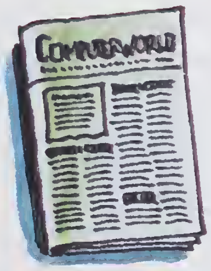

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Our newest publication is *COMPUTER BUSINESS NEWS*, a weekly newspaper for executives in the U.S. computer industry whose organizations are involved in the manufacture, integration and resale of computer systems. This is a relatively new marketplace which has grown up around the minicomputer and microcomputer, and which shows every sign of very rapid growth for at least the next decade.

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Brazil	17	*Data News*

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Digital Optical Disks Seen Next Storage Media

(Continued from Page 43)

disks for consumer home entertainment applications.

"While the requirements are different, many of the basic technological features are directly applicable to digital storage," he added.

"Optical disk technology is likely to provide capacities of 10^{10} bits per unit in 1982, increasing to 10^{12} bits in 1985 and 10^{14} bits in 1989," he said. "The use of multiple units may provide library capacities of over 10^{15} bits by the end of this decade."

Because the present media are not reversible, "digital optical disks will provide a write-once-read-many-times memory function, but this is adequate for many applications such as archival files and disk backup."

Current research notwithstanding, there is presently "a good deal of skepticism" about optical storage methods, even though specifically DP-oriented digital storage systems are among the four areas currently under development. Besides consumer applications, the other areas include digital disks for image or document storage applications and video disks for business/-industrial applications, according to the article.

Noting that present tertiary storage requirements are dominated by mass storage systems based on magnetic tape technology, the newsletter stated, "These are generally complex mechanical systems and the media cost is still high enough to prevent their use in most applications.

"Hence, there is a great opportunity for optical disk storage in digital applications, if present development efforts lead to products that deliver on the promises long offered by optical technologies."

On the other hand, "direct competition with magnetic storage devices will require development of a reversible medium which does not appear imminent," according to the newsletter. "Therefore, optical disks will generally serve different application functions than magnetic tapes and disks."

Uncertainty Over Form

"Despite the prevailing expectations, there is still considerable uncertainty about the exact form the initial products will take," Hobbs noted. "Two or three competitive approaches may appear in initial products from different manufacturers."

For example, a digital image storage system has been announced that scans the input document, digitizes the image and stores it at an address on a 12-in. glass disk coated with a thin ablative film.

Several products have been described, but are not yet available, that use 12-in. disks to store one billion to 10 billion bits (depending on formatting) with about 250 msec access and 4-in. disks to store 100 million bits.

"Such products will be the first to be marketed in the information processing field," the article noted. "They may be formatted for digital data or for digitized image storage."

While any significant impact of digital optical disks is "at least several years away," according to the article, when the technology arrives, static image storage systems will impact the recordkeeping function, the use of microfilm and eventually paper files.

"Media volume of 30 cubic inches and cost of $50 to $100 per [1G byte] will be significantly better than those for magnetic tape, floppy disks, microfilm or paper," Hobbs predicted.

"Thus when device costs are reduced sufficiently an 'electronic file cabinet' for the office is a distinct possibility," he added.

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DP Helps Police Track Crime, Speed Response

By Marguerite Zientara
CW Staff

CHESTERFIELD, Va. — A computerized crime reporting system has enabled the Chesterfield County Police Department here to quickly identify patterns of crime and measure police response times — while the data is still current enough to be helpful.

Until late in 1975, Police Chief Joseph Pittman and his cadre of 150 officers and detectives depended on a completely manual system that often required days or weeks of rummaging through mountains of files to make any sort of criminal analysis.

The department used a "car-dispatch conveyor belt system" for a year before going on-line to the county's IBM 370/138 mainframe with 512K bytes of memory in January 1977. According to Capt. Mason Chalkley, who heads the department's Planning and Research Division, the department is "just beginning to find out" how it can use this resource.

The system incorporates more than 200 programs including an accident file, an investigative case management file and vehicle maintenance file. The department — which has No. 1 priority for its use — can retrieve timely information in seconds, 24 hours a day, on the details of all reported crimes.

"The computer has taken us into the 20th century overnight," Pittman said. "With immediate access to the wealth of information the computer stores, organizes and analyzes, we can get a clearer perspective on the overall and specific crime situation in the county, better serve the public and improve the productivity of the police department."

In addition, the computerized dispatching system "has enabled us to cut in half the time it takes to dispatch a patrol car once a call comes in — and that improves our chances of apprehending a criminal."

Inputting Process

The process of inputting information to the computer — located about 100 yards from the police department building in the County Courthouse Complex — begins when a call is received.

A message-taker, sitting at an IBM 3277 CRT terminal linked over phone lines to the 370/138, enters "incident" information using a predesigned format. Seconds later this data, along with the location and availability of patrol units, automatically appears on the screen of the radio dispatcher's 3277, and he quickly dispatches the nearest patrol car to the scene.

All pertinent information about the incident, including what happened after the police arrived, is recorded and stored in the computer's memory. Later the data is used to generate daily, weekly, monthly and yearly reports, Chalkley explained.

"Without the computer, we'd have to hire many people just to take care of the increasing volumes of paperwork," Pittman indicated. He noted that it used to take two people several days each month to prepare the state-required Uniform Crime Report, a report that now takes "just minutes."

Crime Correlations

"The computer correlates various types of data so we know where crimes are occurring, the types of crimes and the time of day and week they happen," Chalkley said.

Using a security system that prevents unauthorized access to the data base, police personnel can use terminals to "browse" through the computer's files to identify crime patterns and answer other questions. Police investigators can quickly find out how many burglaries occurred in a particular neighborhood the previous month or — if they are working on a vandalism case — determine if there have

(Continued on Page 52)

line of miniperipherals even more attractive."

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STAN WHO?
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See Page 7
I'LL NEVER TELL.
HOW'S THAT, STAN?

Verbatim Ups Prices

SUNNYVALE, Calif. — Verbatim Corp. has announced a general price increase on all its magnetic media products including data cartridges, cassettes and diskettes.

Ranging from 3% on some diskettes to 10% on most data cartridges, the increases were attributed by a spokesman to "major increases in petrochemical and paper prices combined with continuing substantial research and development expenses.

"Because of spiraling raw materials costs, the increases in productivity once realized from large volume orders are no longer adequate to hold prices down," he added.

Verbatim Corp. is headquartered at 323 Socal Way, Sunnyvale, Calif. 94086.

'Focus on Productivity'

NMA Conference Slated for N.Y.

NEW YORK — "Focus on Productivity" will be the theme of the National Micrographics Association's (NMA) 29th Annual Conference and Exposition here April 21-25.

Designed to concentrate on the interrelationship between word processing and data processing, the conference will be organized into two distinct day-long vertical session tracks allowing comprehensive single-day attendance.

The week will open with the association's Education Committe holding the NMA Institute, an intensive two-day introduction to micrographics. The institute will offer short courses in computers, systems design, word processing, micrographics fundamentals, computer output microfilm (COM), retrieval and image transmission.

The vertical sessions will begin on Wednesday, April 23, with programs dedicated to computers — with such topics as COM and computer-assisted retrieval. The second set of programs, on Thursday, will focus on information management in banking and finance.

Conference Fees

The conference will feature more than 90 exhibitors. Preregistration fee for the complete conference is $285; admittance costs $335 at the door. Both include individual membership to NMA effective July 1.

The basic conference fee is $220 in advance or $270 at the door. This fee includes everything except function tickets for the keynote luncheon, awards banquet and conference breakfast.

There will be five seminars on Monday and six on Tuesday, priced from $120 to $165 each if paid in advance or $20 more at the door.

Daily admittance costs $80 for a full day's session and $40 for a half-day. An exposition pass costs $5.

More information is available from the Conference Department, National Micrographics Association, 8719 Colesville Road, Silver Spring, Md. 20910.

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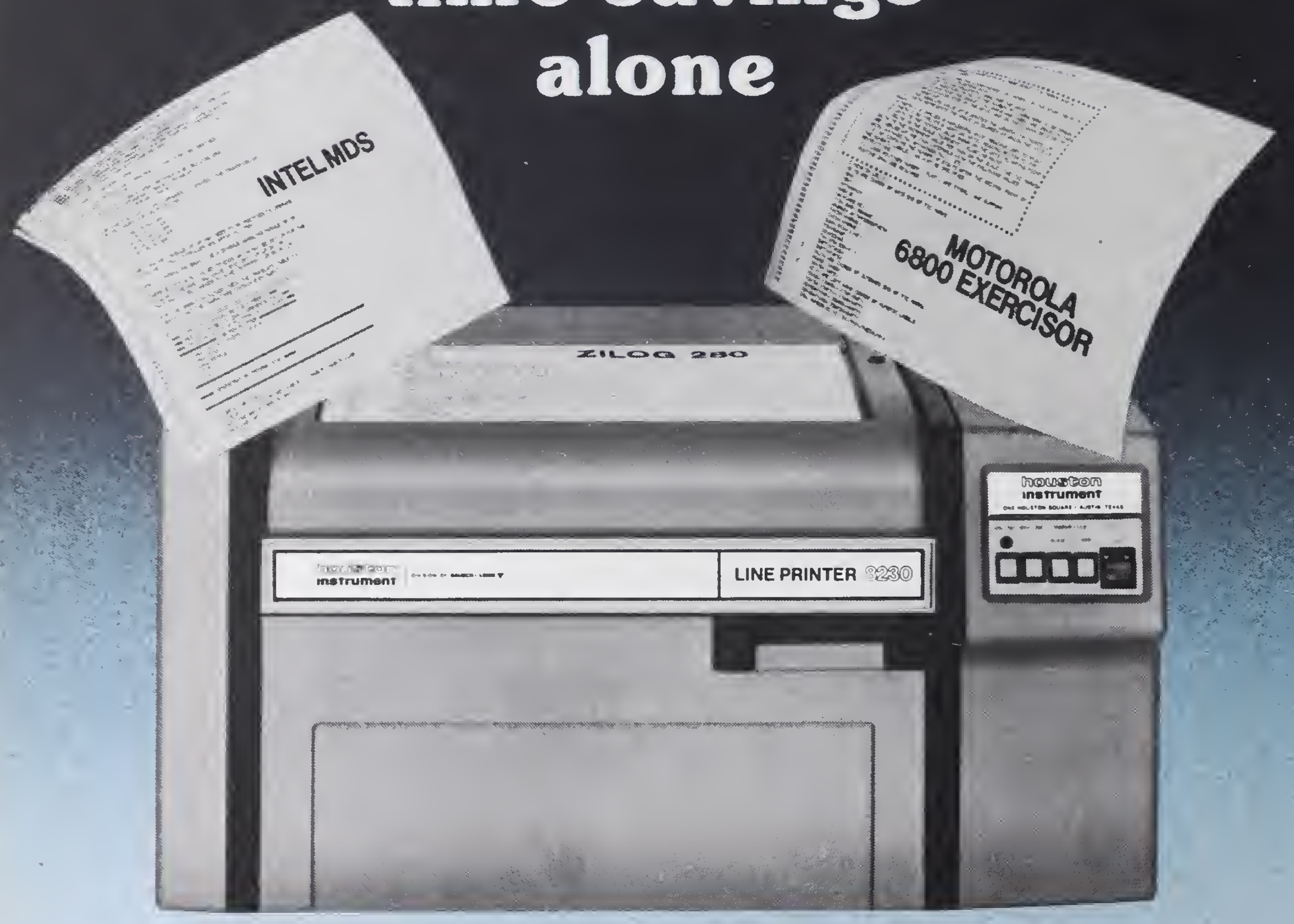

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Police DP Tracks Crime

(Continued from Page 51)

been other similar cases in the same area.

"Investigators are now eager to pursue leads that previously would have meant searching — sometimes in vain — through stacks of reports," Chalkley observed. "In the past, if we apprehended a burglar and he told us he had broken into 20 houses in a subdivision over the past year, it was nearly impossible to track down all the original police reports.

"Now we can go to the computer and within seconds get a list of the burglaries in that subdivision over the past year," the police captain said, "and we can close 20 cases instead of one."

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CAPACITY MANAGEMENT

By Kenneth W. Kolence

Computer performance measurement is a popular subject these days for many reasons. Undoubtedly the most important is its proven capability for producing significant savings by deferring equipment acquisition.

Beyond this, it has generated excitement by providing management with the first tools for actually measuring the balance between workload capacity requirements and the capacity available in the equipment. This latter is of greater significance than mere "tuning", since it holds out the eventual promise of accurate planning and adequate management control of the use of computers.

The totality of all the techniques and procedures for accomplishing this is called *capacity management* and is the current applications area of the theory of software physics.

Capacity management is a very pervasive activity in most installations — so pervasive that it often proves the old adage about not being able to see the forest for the trees. Capacity management is not a single function, but the set of all functions concerned with different aspects of reliably providing computing capacity, intelligently conserving its use and getting correctly paid for it when used. As such, it encompasses such diverse activities as workload characterization, workload forecasting, equipment planning, costing and charge procedures, scheduling, performance planning and, of course, performance improvement in a myriad of ways.

It also includes all of the measurement and reporting systems, and the management methods for using these systems to maintain control over the configuration and its usage.

To see capacity management as a single forest, one must back off some distance. This is often difficult to do when one is continuously engaged in putting out the fires in this forest. But once this forest is seen properly, the key to fire prevention becomes obvious. It is the consistent use of a single quantitative definition of computing capacity which meets certain basic requirements. This definition is provided by software physics in the form called software work and in a corresponding form known as software power.

Management Overview

Figure 1 can be considered as sort of an observation point from which to survey the capacity management functions, and for that reason it is called the Capacity Management Overview. It is perhaps best to point out the major landmarks and topographical features first and then return to a more detailed consideration of this at once familiar and yet new subject.

The overview is divided into three main sections, corresponding to the three types of general activities identifiable in capacity management. These are:

(1) *Planning:* Generally, these activities are concerned with establishing both what capacity usage levels will be required and how such capacity will be provided and distributed over time. The costs of providing it are determined and the planned methods and levels of cost recovery determined.

(2) *Data Collection & Analysis:* Given a set of plans for capacity usage relative to the capacity available from a set of equipment, it is necessary to continuously measure the actual usage and report it in directly comparable terms. An instrumentation system is needed, and the measurements obtained by this system must all be quantitatively related to one another and represent capacity usage.

In practice, the basic continuous instrumentation is for purposes of billing. Other instrumentation tools such as hardware and software monitors are

(Continued on In Depth/2)

CAPACITY MANAGEMENT OVERVIEW

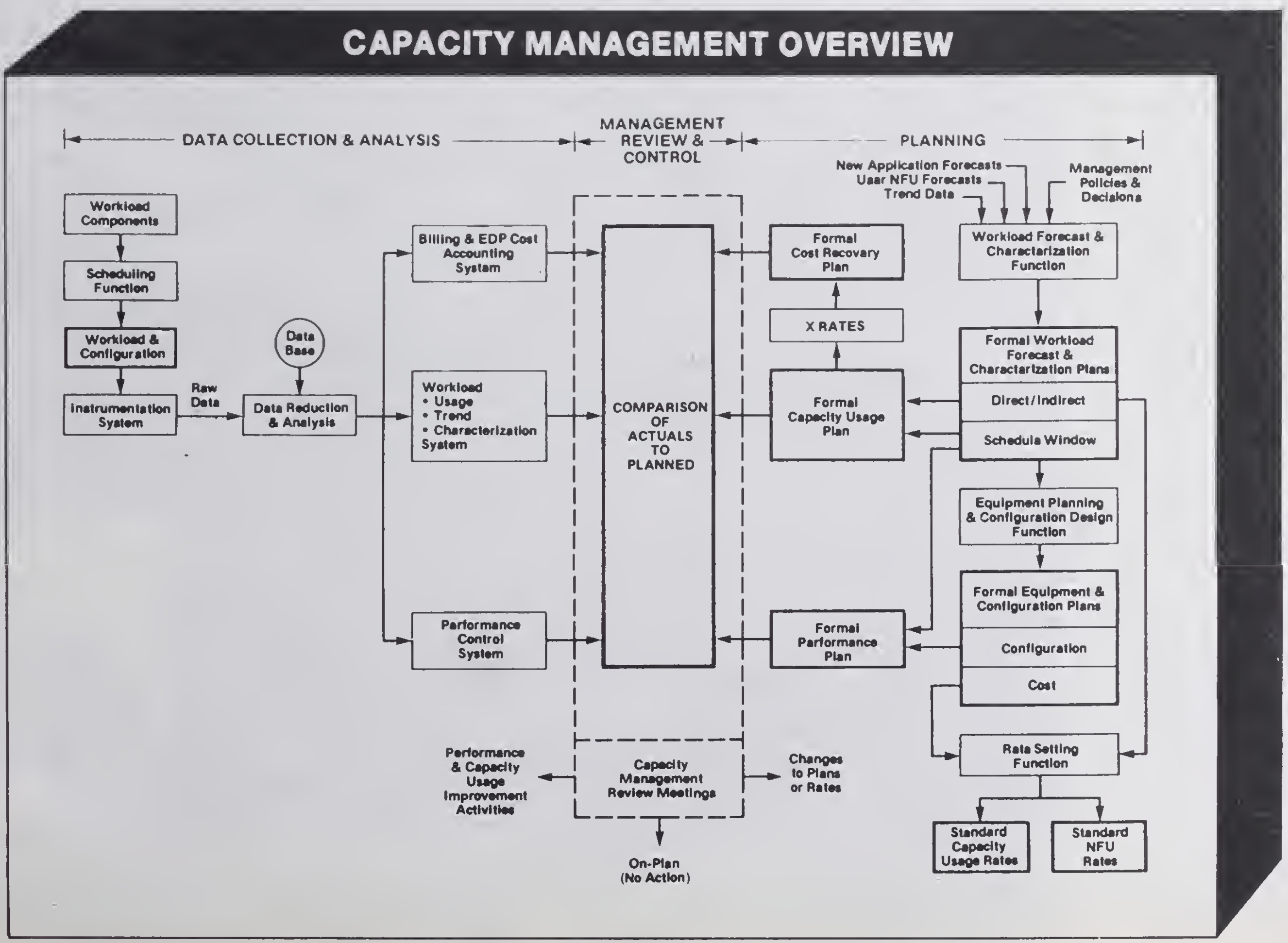
DATA COLLECTION & ANALYSIS
MANAGEMENT REVIEW & CONTROL
PLANNING
Workload Components
Scheduling Function
Workload & Configuration
Instrumentation System
Raw Data
Data Base
Data Reduction & Analysis
Billing & EDP Cost Accounting System
Workload • Usage • Trend • Characterization System
Performance Control System
COMPARISON OF ACTUALS TO PLANNED
Performance & Capacity Usage Improvement Activities
Capacity Management Review Meetings
On-Plan (No Action)
Changes to Plans or Rates
Formal Cost Recovery Plan
X RATES
Formal Capacity Usage Plan
Formal Performance Plan
New Application Forecasts
User NFU Forecasts
Trend Data
Management Policies & Decisions
Workload Forecast & Characterization Function
Formal Workload Forecast & Characterization Plans
Direct/Indirect
Schedule Window
Equipment Planning & Configuration Design Function
Formal Equipment & Configuration Plans
Configuration
Cost
Rate Setting Function
Standard Capacity Usage Rates
Standard NFU Rates

Figure 1

(Continued from In Depth/1)

usually used on other than a continuous basis, but their measurement data must be fully compatible with all other instrumentation data.

Given the collection of the data, it must be processed into usable forms, such as billings. It should also be compared directly with the various plans, as shown in the overview.

Finally, the information needed for planning purposes must be properly provided. Primarily, this is indicated on the overview by the "Workload Usage, Trend and Characterization System."

(3) *Management Review & Control:* The third major section of the overview represents the feedback and corrective activities of capacity management. Actual capacity usage and characterization of the workload in its various forms are compared with the equivalent plans.

When actuals are found to consistently fall outside of acceptable limits of variation from the plan, some form of corrective action is generally called for. Depending on the circumstances and the judgment of management, as well as the available budget, either the plans must be changed to reestablish new and achievable expected baselines of usage, or performance change activities must be instituted to bring actuals back within acceptable plan limits. The reports and analyses provided should directly support these choices and identify the most cost-effective actions.

Basic Questions

It is not necessarily obvious from the overview, but the concern of capacity management is centered around the following basic questions:

- What are the capacity requirements of the workload for any component of the workload? These requirements need to be expressed in units which are independent of the exact characteristics of the equipment on which the workload is to be processed. If these units are not, then equipment changes invalidate the statement of capacity requirements. This description is called the *workload characterization.*
- What is the capacity available from the equipment under different configuration connections?
- How much of the available equipment capacity can be utilized by the workload and, therefore, what is the most cost-effective configuration to process the workload within service and reliability constraints?

Capacity management is concerned with planning answers to these questions, measuring the actual answers to these questions, and acting to maintain the most cost-effective match between the workload and the equipment. Thus, capacity management is concerned with managing the workload capacity requirements, the equipment and capacity it provides and the matching of the workload requirements to the equipment capacity.

Since cost-effectiveness is but another term for computing productivity, a consistent method of establishing costs must be completely integrated into the overall capacity management approach. This then becomes the means by which a given matching of the workload to a configuration can be determined to be an improvement.

Software Work as Measure of Capacity Usage

There are many measures of capacity and performance in current use today and a wide number of variations on how to use each for workload forecasting, equipment planning, charging and related functions. One of the basic requirements for success — that is, practical usefulness-of a theory such as software physics is that it be able to mathematically derive *all* such measures, and formalize all effective methods of using these measures, with but a very limited number of basic measurable properties.

In fact, this has been successfully done, and in the process these common measures and procedures have been precisely and rigorously defined. Only three basic measurable properties have been found to be needed: software work, time and storage occupancy. Of these, software work is the key property since it characterizes the workload without being dependent on specific equipment or configuration characteristics.

One unit of software work is done by a processor on some storage device when the processor transfers one byte to that storage device. For example, a

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tape drive or disk drive writing a 2,000-byte block does 2,000 units of work on the tape or disk pack. If the same block is read, the drive does 2,000 units of work on main storage.

A printer does 132 units of work whenever it prints a 132-character line. A card reader does 80 units of work on main storage for each card read, and a card punch does the same amount for each card punched.

The central processor does a unit of work on main storage for every byte transferred into real storage. It also does a unit of work on the CPU registers for each byte accessed from main storage. The total CPU work is the sum of these two types of work.

Software work can be calculated from the normal types of measurements collected by SMF. For peripheral drives, the work performed is equal to:

$$work = (\#I/O\ actions)\ (average\ block\ size)$$

For the CPU, it is necessary to measure the average work per second (called software power) with a hardware monitor. Taking this average power value as a constant for a given CPU such as an IBM 370/168, the common measure "CPU seconds" is easily converted to units of software work. The basic equation for software power is:

$$power = \frac{work}{time}$$

Therefore, one has for the CPU,

$$work = (av.\ cpu\ power)\ (cpu\ seconds)$$

There are many measurement tools that can be used to determine the software work used by a workload, application or other workload component. SMF provides the data needed for batch work, hardware monitors can measure work directly for the full workload and selected portions thereof, and software monitors such as RMF likewise provide much of the data needed. Taken together, these instrumentation tools are adequate to the task of collecting the data needed for capacity management.

There are two basic ways in which the software work done by a workload or workload component can be described. One way is to determine the work done by subconfiguration; that is, CPU and channel, control unit or drive. Although useful and used for several purposes in software physics, this characterization is obviously not independent of the configuration.

The more generally useful characterization form is to classify the work by equipment class for any given workload or workload component. That is, a workload or workload component is generally characterized by the work done by the CPU, by disks, by tapes, by terminals, by printers and so forth. The total work done is simply the sum of the work by equipment class. The most useful characterization form, however, is to maintain the work separately by equipment class. When this is done, the form is called a *software work vector.*

Software work, and particularly the software work vector by equipment class, is constant for a given job, application or other workload component processing a given set of data, regardless of equipment configuration or workload job mixture. The rate at which the work is performed — the software power used — will of course vary and this represents the effect of the configuration and equipment relative to the capacity requirements of the workload and its components.

The fact that the software work vector is independent of the equipment and workload mix permits it to be the basic method for quantitatively representing any workload or portion thereof. In particular, software work expressed in this form represents the capacity requirements of the workload in the correct sense of the term. It can be used for all the various capacity management functions which utilize workload characterization.

Basic Planning Function

Returning to the overview of Figure 1, the basic planning function is that of workload forecasting, since all the other plans and planning activities depend on the forecast. This is easily verified by tracing the dependencies indicated in the overview. The software work vector must be capable of being used for all forecasting purposes, and in fact it displays outstand-

(Continued on In Depth/4)

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(Continued from In Depth/3)

ing attributes for this function.

The basic workload forecasting methods in capacity management depend on the use of a special form of the software work vector, called the software unit vector. It is worthwhile demonstrating these methods with a simple example.

Generally, the software work vector contains elements or numbers representing the work performed in each equipment class. However, a simplified vector composed of just the work by the CPU, disks and tapes can be used to illustrate the techniques.

For a given application, job, or other workload component of interest, one can measure the work done by equipment class and represent the software vector as below:

$$\text{work} = \begin{bmatrix} \text{cpu work} \\ \text{disk work} \\ \text{tape work} \end{bmatrix}$$

Assume the job does 600 units of CPU work, 200 units of disk work and 100 units of tape work. The total work is therefore 900 units, equal to the sum of the work done in each of the simplified sets of equipment classes. One may thus write:

$$\text{work} = \begin{bmatrix} 600 \\ 200 \\ 100 \end{bmatrix} = 900 \cdot \begin{bmatrix} 600 \div 900 \\ 200 \div 900 \\ 100 \div 900 \end{bmatrix}$$

$$= (\text{total work}) \cdot \begin{bmatrix} .67 \\ .22 \\ .11 \end{bmatrix}$$

The vector quantity (0.67, 0.22, 0.11) is called the software unit vector, and the sum of the elements is always equal to 1. This is because the individual original elements are each divided by the total work of the original software work vector.

For many, if not most workload components, the software unit vector is constant regardless of the quantity of total work performed. Those that are not constant are treated in a similar way to that about to be described, but will not be considered here.

The constancy of the software unit vector means that for a given run or set of runs of a workload component, the only quantity which will vary will be the total work. This can be easily verified in most installations by taking some major batch application for which SMF data is available, and calculating the work for several different months using assumed block sizes, EXCP counts and an assumed CPU power. The total quantity of work may vary, but the software unit vector will generally remain quite stable.

Workload Forecasts

The stability of the software work unit vector may be used in two different ways to prepare workload forecasts of software work by equipment class. The first is simple trend forecasting. In this case, the total work over time is plotted, and the future total work is extrapolated. By multiplying the projected total work by the software unit vector, one obtains the projected work by equipment class.

For example, assume the projected total work in some month is 1,500 units for the job whose unit vector is (.67, .22, .11). Then the projected work by equipment class is:

$$\text{projected work} = 1500 \cdot \begin{bmatrix} .67 \\ .22 \\ .11 \end{bmatrix} = \begin{bmatrix} 1005 \\ 330 \\ 165 \end{bmatrix}$$

That is, 1,005 units of CPU work are projected, 330 units of disk work and 165 units of tape work.

This trend forecasting technique is quite similar to techniques used in practice today, but has the advantage of requiring only that total work be forecast.

However, an even better technique that can often be used is based on the user projecting his requirements in the units most natural to the purpose of the application. For example, a payroll application is most naturally forecast in terms of the number of paychecks to be produced per month. An order processing application is most naturally projected in units of orders received. All such business-oriented "projection units" are called natural forecast units (NFUs).

If the total software work done by an application is divided by the number of NFUs processed or produced (such as checks or orders), the work per NFU is usually found to be constant.

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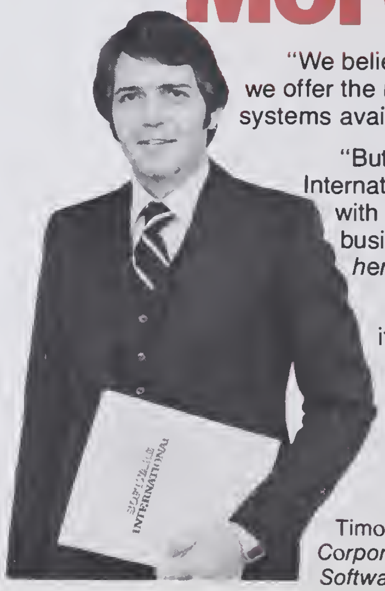

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In these cases, an NFU projection is easily converted to a software work projection by equipment class. If the work per NFU is not constant, other techniques in software physics are normally available to accomplish the same end result.

Again, an example is useful. Assume the first example where the total work was 900 units, 50 orders were processed and that "orders" is an NFU for the application. Then the work per order is 900 ÷ 50 = 18.

In the example where 1,500 was the total work, one would expect to have processed 1,500 ÷ 18 = 83.3 orders.

Since NFUs normally only come in integer quantities, 83 or 84 orders would be actually observed, with the difference being considered as observational error.

If a user projected 20,000 orders per month, then this would be converted to units of work by equipment class as follows:

projected work

$$= 20{,}000 \text{ orders} \cdot 18 \text{ w/order} \cdot \begin{bmatrix} .67 \\ .22 \\ .11 \end{bmatrix}$$

$$= 360{,}000 \cdot \begin{bmatrix} .67 \\ .22 \\ .11 \end{bmatrix} = \begin{bmatrix} 241{,}200 \\ 79{,}200 \\ 39{,}600 \end{bmatrix}$$

That is, 241,200 units of CPU work are projected, 79,200 units of disk work and 39,600 units of tape work.

In the overview of Figure 1, the middle data reduction and analysis subsystem is called the Workload Usage, Trend and Characterization System. Actual measurement of the applications software work by equipment class would be used to initially determine the work per NFU and the software work unit vector.

Subsequently, trend forecasts and NFU forecasts could be compared to prepare actual workload forecasts for the application. The actual total work and the actual software work unit vector would then be compared to the projection for management review and control purposes.

Repeatable Quantity

Software work is the only repeatable quantity in software physics, at least in the sense normally used for job-accounting purposes. Rates based on projected software work and equipment class costs can be developed and used to develop a complete DP usage cost accounting system and charge formulas. This in fact has been done, and is completely described in the Institute publication *EDP Job Costs and Charges.*

The combination of this cost and charge methodology with the concept of NFUs permits charges to be on a "per transaction" basis — that is, a standard charge per NFU processed can be established. This technique of charging can be used where appropriate, and charges based on actual resource usage (software work) used where necessary. The NFU charges are, however, generally preferred by an installation's customers and users. The procedures for rate setting are considered part of the planning aspects of capacity management, and so are shown in this section of the overview chart.

Software Power as Throughput

Software work represents the "how much" of a workload. To determine "how quickly," one needs to introduce the property *time*. Since work divided by time is software power, the "how long to do how much" of capacity management is generally discussed in terms of software power. The software power used by a workload is normally less than the software power available from a configuration.

Whereas one can directly measure the power usage level, the power available must be determined by calculations based on software physics theory. The basic techniques of equipment planning and workload balancing involve matching the workload power usage requirements to this theoretical capacity available from the equipment.

Software power usage by the workload at the full configuration level is equivalent to the normal concept of throughput; that is, the number of jobs processed per unit of time. The process of demonstrating this mathematically is quite simple, and in so doing the installation "standard job" is

(Continued on In Depth/6)

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(Continued from In Depth/5)

automatically defined.

The advantages of using throughput power instead of just throughput are many, but an advantage of practical importance is that it permits direct and proper comparisons of the throughput between configurations — either within the same installation over time or between installations.

To show that the normal idea of throughput is equivalent to full configuration software power, consider several different jobs, called $S_1, S_2, \ldots S_n$, where n is the number of jobs. Then the throughput obtained by processing these in some elapsed time T is:

$$\textit{throughput} = \frac{n}{T}$$

The software work done by each job can be expressed as $W_1, W_2, \ldots W_n$. The total work is simply the sum of the work by job, so the software power level associated with processing the n job is:

$$\textit{software power} = \frac{W_1 + W_2 + \ldots W_n}{T}$$

The average work per job is just the total work divided by n; i.e.:

$$\overline{W} = \textit{average work per job}$$

$$= \frac{W_1 + W_2 + \ldots W_n}{n}$$

Therefore, the software power used can be expressed as:

$$\textit{software power} = \frac{n \cdot \overline{W}}{T} = \frac{n}{T} \cdot \overline{W}$$

$$= (\textit{throughput})\ (\textit{av. work per job})$$

The normal idea of throughput is plagued with the problem that jobs are "different sizes," and therefore the measure is not consistent over time even within the same installation. However, it is easy to determine the overall average work per job of an installation. Simply add up the total work over several months time and divide by the number of jobs represented. Then one may express throughput in terms of these "standard jobs" as follows:

- Let W equal the total work performed over any elapsed time T.
- Let $\overline{W}$ equal the work done by the standard installation job.
- Then $W \div \overline{W} = n$ equals the number of equivalent standard jobs represented by the total work performed during time T, and

$$\textit{throughput} = \frac{W}{T} \div \overline{W} = \frac{n}{T}$$

$$= (\textit{software power}) \div (\textit{standard job work})$$

One can use these relationships to compare standard jobs between installations and to compare the standard jobs found in different workloads in the same installation. As can be seen with a little reflection, the variability of the measure "throughput" as defined with job size is purely a function of the "standard job" work. This quantity really acts simply as a "unit of measure" conversion factor, and the common measure for throughput is simply software power expressed in units of software work per second.

The term *throughput power* is used to distinguish this more general and universally comparable throughput measure.

Throughput power is the total work done by a configuration for a subworkload in a unit of time. It represents the rate at which total work is actually done on the full configuration.

As has been shown, the total work of a workload or workload component is expressible in a vector form by equipment class. It is therefore possible to express throughput power in terms of the work done by the CPU, disks, tapes and so forth. Again limiting the discussion to just these three equipment classes for simplicity of explanation, one can write:

$$\textit{throughput power} = \frac{1}{Te} \cdot \begin{bmatrix} \textit{cpu work} \\ \textit{disk work} \\ \textit{tape work} \end{bmatrix}$$

The symbol Te denotes the elapsed time for the entire configuration. Dividing Te into each vector element, one has:

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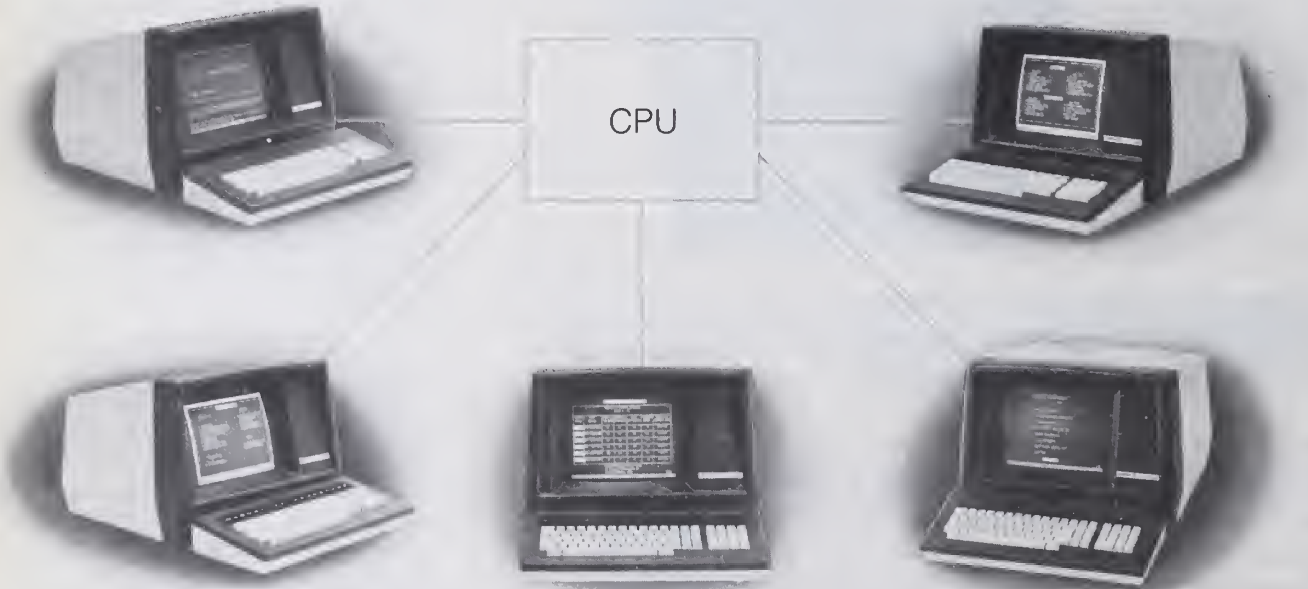

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$$\textit{throughput power} = \begin{bmatrix} \textit{cpu work} \div Te \\ \textit{disk work} \div Te \\ \textit{tape work} \div Te \end{bmatrix}$$

Each of these vector elements represents the average power used within the equipment class over the elapsed time *Te*.

This is called the *relative power usage* of the equipment class because the time is relative to the full configuration, not the equipment class. The *absolute power usage* is calculated by taking the execution time of the equipment class. For example, if the CPU is in execution for time *Tx(cpu)*, then the absolute CPU power usage will be:

- $\textit{absolute cpu power used} = \dfrac{\textit{cpu work}}{Tx(cpu)}$

Similarly, one has:

- $\textit{absolute disk power used} = \dfrac{\textit{disk work}}{Tx(disk)}$
- $\textit{absolute tape power used} = \dfrac{\textit{tape work}}{Tx\,(tape)}$

Throughput power can be related to the absolute powers of equipment classes very simply. In general, one has:

$$\textit{throughput power} = \begin{bmatrix} \dfrac{Tx(cpu)}{Te} \cdot \dfrac{\textit{cpu work}}{Tx(cpu)} \\ \dfrac{Tx(disk)}{Te} \cdot \dfrac{\textit{disk work}}{Tx(disk)} \\ \dfrac{Tx(tape)}{Te} \cdot \dfrac{\textit{tape work}}{Tx(tape)} \end{bmatrix}$$

But the quantities of the form *Tx(cpu) ÷ Te* are essentially the *percent utilizations* obtained by hardware and software monitors. There is a distinction, since the quantities *Tx(disk)* and *Tx(tape)* represent the time any disk and any tape are in execution, not the % channel utilizations normally obtained. However, other forms of the software work vector which relate more directly to the configuration can also be used. These then involve percent utilization factors more comparable, but not identical to, standard channel utilization percentages.

The sum of the utilization percentages, by the way, represents the degree of multiprocessing occurring in the configuration. Mathematically, this equals:

$$MP = [Tx(cpu) + Tx\,(disk) + Tx\,(tape)\,] \div Te$$

Similar relationships are derivable for multiprogramming levels. The distinction between relative and absolute power is quite important for many practical applications of software physics, essentially because:

(1) the theoretical power of a configuration is derived in terms of absolute power, and

(2) the balance or match between a workload and a configuration is reflected by the extent to which relative powers differ from absolute powers, as well as the extent to which actual observed absolute powers differ from the theoretically possible absolute powers.

Calculating Power

At this point, one can proceed to consider the general methods of calculating the power available from a configuration, which is considered as theoretical capacity in software physics. Alternately, one can demonstrate how throughput power and software work concepts can be used to predict the effect of configuration and equipment changes, and/or workload performance changes, on throughput power.

This latter demonstration is of more direct interest, but is more meaningful if presented with some background on the absolute power levels possible from equipment. Therefore, the subject of theoretical capacity or power will be briefly introduced. It will then be followed by the techniques of how to describe the balance between a workload's inherent power requirements and the power available from a set of equipment.

Software Power as Capacity

Although one speaks of the theoretical capacity of a configuration, one really needs to be able to establish the maximum capacity available from any part of the system as well as the complete system. It is useful to introduce the overall subject of capacity calculations with a few general remarks and

(Continued on In Depth/11)

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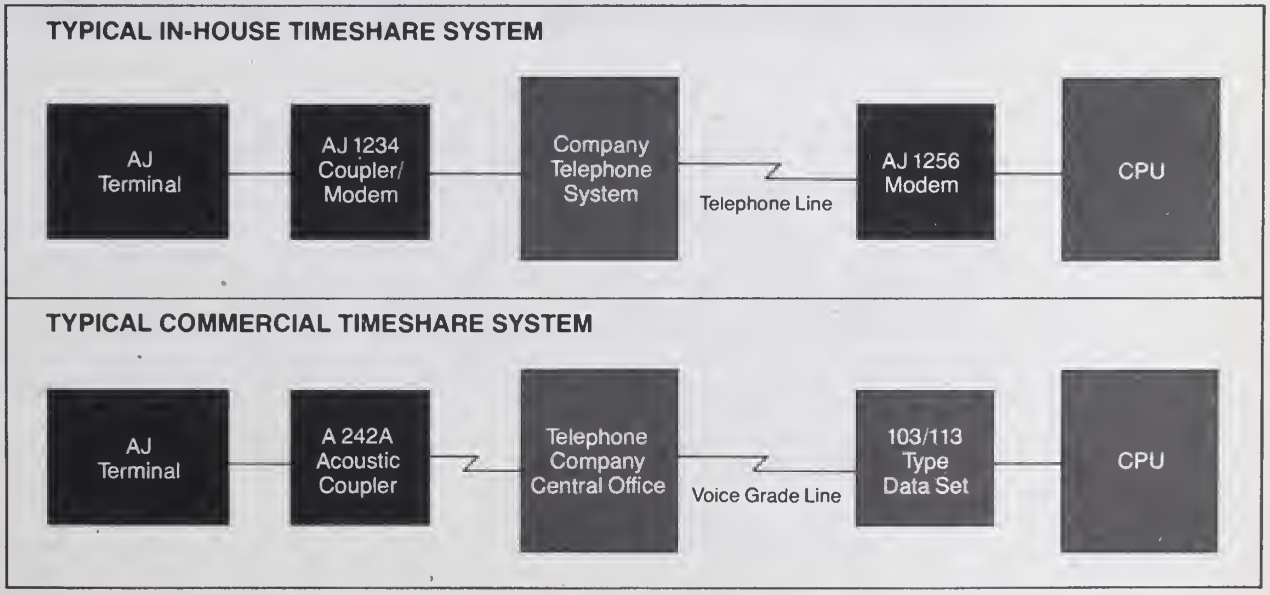

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Day 1 Conference

D-1 8:45-9:45 EXECUTIVE BRIEFING: RAISING BUSINESS PRODUCTIVITY VIA INFORMATION SYSTEMS TECHNOLOGY AND PLANNING: Arnold Keller, Editorial Director, Infosystems Magazine; DuWayne Peterson, V.P. MIS, Security Pacific National Bank.

D-2 10:00-11:00 IMPROVING EDP PERSONNEL PRODUCTIVITY: Ira Gottfried, President, Gottfried Consultants, Inc. Find out how to motivate today's highly skilled — and scarce — computer system pros.

O-1 11:45-12:30 HOW WORD PROCESSING CAN BREAK THE OFFICE PAPERWORK BOTTLENECK: Charlcie Grasser, Mgr., Office Systems, Kaiser Aluminum; Estella Brown, Supervisor WP, Irell & Manella; Carolyn Ratliff, Staff Assistant, Admin. Services, Golden State Mutual Life Insurance.

O-2 11:45-12:45 HOW TO CUT COMMUNICATION COSTS: Kenneth Asten, Telecom Consultant.

M-1 1:30-2:30 AUTOMATION FOR PLANT PRODUCTION AND TESTING APPLICATIONS: Dan Appleton, President, D. Appleton Company.

D-3 3:30-4:30 COMPUTER GRAPHICS: NEW WAYS TO VISUALIZE COMPUTER INFORMATION FOR BUSINESS, ENGINEERING AND RESEARCH USERS: Richard Horn, Lockheed-California Corporation.

M-2 3:30-4:30 OPTIMIZE MANUFACTURING PRODUCTIVITY VIA SMALL AND LARGE COMPUTER APPLICATIONS: Case histories will illustrate the most efficient uses of manufacturing resources.

Day 2 Conference

O-3 8:45-9:45 COMBINED WORD & DATA PROCESSING: George Tamas, President, Tamas & Associates. Exploring distributed word and data processing applications in large and small companies.

D-4 10:00-11:00 DATA BASE OPPORTUNITIES IN CENTRALIZED AND DISTRIBUTED SYSTEMS: Jerry Smith, Mgr., Data Admin. at Lockheed-California Corporation. The latest trends in mainframe and minicomputer oriented data base software.

D-5 11:45-12:45 DISTRIBUTED PROCESSING: USER UPDATE ON THIRD GENERATION EXPERIENCES: Ken Hanna, Principal, Peat, Marwick & Mitchell; Frank Varenchik, Mgr., Dillingham, Roger Allen, Chairman of Panel, I.D.C. How "leading edge" users in financial and manufacturing industries are integrating the latest hardware systems.

D-6 1:30-2:30 FINANCIAL & MANAGEMENT PLANNING TECHNIQUES USING EDP TOOLS: Bill Finkelstein, V.P. & Mgr., ADP Planning Division, Security Pacific National Bank. How to make cash resources more productive through software application packages and data base tools.

D-7 3:30-4:30 SMALL AND DESK TOP COMPUTERS FOR PROFESSIONAL AND BUSINESS APPLICATIONS: John Craig, Publisher, *Infoworld;* Victor Deutsch, Controller, Fishking Processor, Inc. How small computers can solve big managerial and technical problems.

O-4 3:30-4:30 LINKING WORD PROCESSING AND PHOTOTYPESETTING TO CUT REPROGRAPHIC COSTS.

Day 3 Conference

D-8 8:45-9:45 ENHANCING SOFTWARE/APPLICATION PRODUCTIVITY FOR END USERS: Merv Dirks, DP Coordinator, Lockheed-California Corporation. New programming techniques including structures analysis.

O-5 10:00-11:00 HOW TO USE COMPUTERIZED TELEPHONE SYSTEMS

O-6 10:30-12:30 INTEGRATED INFORMATION SYSTEMS: Bruce Peters, Mkt. Mgr., SDC; E. Rotolo, V.P. Security Pacific National Bank; Cynthia Jones, WP Center, UCLA; Thomas Wardlaw, Mgr., Office Systems, Tosco Corp. Expanding managerial productivity in the "office of tomorrow."

S-1 1:30-2:30 SMALL COMPUTERS FOR MARKETING & DISTRIBUTION APPLICATIONS: Victor Deutsch, Controller, Fishking Processor, Inc. How hardware can help get more sales marketing dollar.

O-9 3:30-4:30 HOW TO COMPARE SMALL SYSTEMS FOR ON-SITE AND DISTRIBUTED APPLICATIONS: Chairman, Dr. Larry Press, Consultant & *Infoworld* Columnist.

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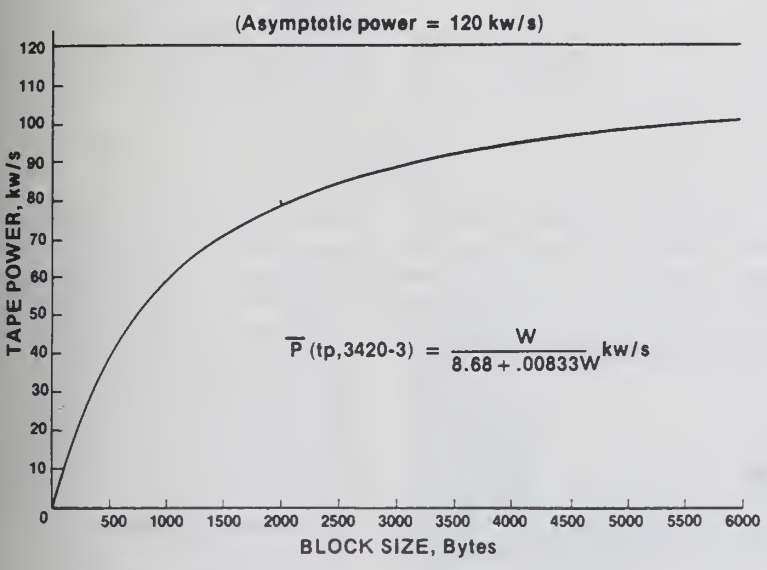
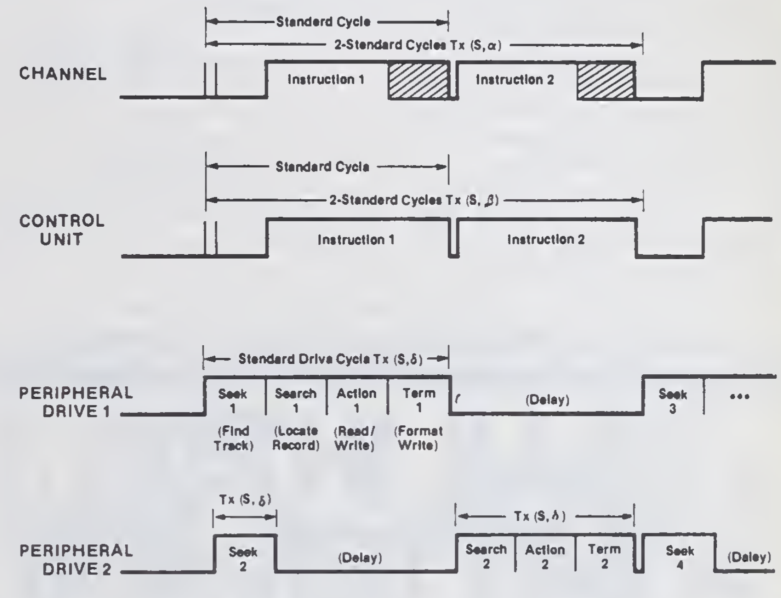


TABULAR VALUES: $P\,(tp,3420\text{-}3) = \dfrac{W}{8.68 + .00833W}$ kw/s

Block Size (bytes)	Execution Time (10^{-3} sec)	Tape Power (kw/s)	% Block Size Efficiency
80	9.35	8.6	7.4
250	10.77	23.2	19.3
500	12.85	38.9	32.4
1000	17.02	58.8	49.0
2000	25.35	79.2	68.0
3000	33.87	89.1	74.2
4000	42.02	95.2	79.3
5000	50.35	99.3	82.8
8000	58.89	102.2	85.2
7000	67.02	104.4	87.0
8000	75.35	106.2	88.5
9000	83.69	107.5	89.6
10,000	92.02	108.7	90.1
100,000	841.98	118.8	99.0
1,000,000	8341.68	119.9	99.9

Continuous Read/Write Power Curve for IBM 3420 Model 3 Tape Drives

Figure 2



Type 2 I/O State Chart Standard Cycles

Figure 3

(Continued from In Depth/7)

then demonstrate the concepts with some intuitively clear examples. The general methods of calculating the capacity of an arbitrary configuration are somewhat technical, but the simple examples provided herein should at least indicate the general approaches used in software physics.

If a workload or workload component represents a certain quantity of software work to be done, then the capacity of a system or component of a system is its ability to perform work. In practice, this means the rate at which it can perform work; that is, the theoretical software power of the system or system component. This theoretical power corresponds to the level of power usage which would be measured if an "ideal workload" were to be run on the system, in exactly the same way that an electrical generator has a theoretical power observable only when an exact impedance match is obtained with an ideal electrical load.

Given a workload, it is always possible to specify an ideal configuration to process that workload. Conversely, given a configuration, one can always specify an ideal workload to be run on it.

The practical problem in capacity management is to bring both the workload and configuration into balance for as large a percentage of the time as possible. Since workloads are neither simple nor constant, compromises must always be made. A knowledge of what the ideal balance should be permits these compromises to be made in intelligent and cost-effective ways.

Again in analogy to electrical loads, the capacity characteristics of a complete system depend on both the characteristics of the individual devices in the system and the pattern or configuration into which the devices are connected. Take, for example, a single tape drive. Its absolute theoretical power can be easily determined at any block size.

In the case of an IBM 3420 Model 3 drive, the execution time for an average block size equal to a quantity of work W is $5 + (120)^{-1}\,(W + 82)\,10^{-3}$ seconds. The absolute software power available from the drive is therefore:

$$power = \frac{W}{5 + \dfrac{1}{120}\,(W+82)}\;10^{3}\ work/sec$$

When this equation is solved and plotted for a variety of block sizes, the values are given in Figure 2.

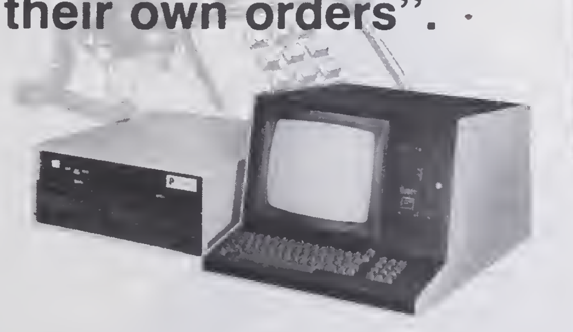
Normally, tape drives come in sets of up to eight drives per control unit. The next question is therefore, "what is the capacity or theoretical software power of a tape drive control unit subconfiguration?" The key observation is that only one tape drive can be in execution at a time within a tape drive control unit subconfiguration, because the control unit is in execution whenever a tape drive is in execution. Therefore, the capacity of an entire tape drive control unit subconfiguration is equal to the absolute power of only a single drive, regardless of how many drives are in the subconfiguration.

Exactly similar arguments reveal that a channel subconfiguration to which only tape drive control unit subconfigurations are attached likewise has a maximum theoretical absolute software power equal to that of a single tape drive. Thus, for these conditions, the table (Figure 2) represents the theoretical tape power of a single tape drive, a control unit subconfiguration or a channel subconfiguration regardless of the number of drives attached.

The reason the power available from sets of tape drives is equal to that of a single drive in the foregoing example is that overlapped execution cannot occur. Within disk control unit subconfigurations, it is possible for seek and in some instances search times to be overlapped. The extent of possible overlap determines the total execution time required to complete a set of disk I/O commands. For example, Figure 3 shows how 3330 disk drives operating in a non-RPS mode can be overlapped.

The general formula for the minimum execution time to process a set of N disk I/O's applies when one I/O command per spindle is being executed. Therefore, N represents the number of spindles in the subconfiguration. Again, let W equal the average

(Continued on In Depth/12)



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(Continued from In Depth/11)

block size, equivalent numerically to the average work per I/O. Then the absolute power available from a disk drive control unit configuration is expressed as shown in Figure A.

For a 3330, IBM's quoted values for average seek and search time are:

av. seek time = $20 \bullet 10^{-3}$ seconds
av. search time = $8.3 \bullet 10^{-3}$ seconds

The average data transmission time for a 4,096-byte block is (1.24×10^{-6} sec/byte) (4,096 bytes) = 5.1×10^{-3} seconds. Therefore, the absolute software power for a 4,096-byte average block size equals:

$$power = \frac{N(4.096) \bullet 10^6}{20 + N(8.3+5.1)}$$

$$= \frac{N(4.096) \bullet 10^6}{20 + N(13.4)}$$

This equation is solved and tabulated in Figure B for one through eight spindles.

$$power = \frac{N \bullet W}{av. seek\ time + N \bullet (av.\ search\ time + av.\ data\ xmit\ time)}$$

Figure A

The capacity or software power of a channel subconfiguration with only one disk control unit subconfiguration attached is the same as the previous tabulation. Without demonstrating the calculations, it should be intuitively clear that the channel configuration disk power is effectively unchanged by adding additional disk control unit subconfigurations to the channel.

Thus, a good first approximation to assume usually is that adding additional disk control unit configurations to a channel adds only on-line storage, not software power. The same is true of adding spindles to a control unit.

No. of Spindles N	Power (*1000 w/s = 1 Kw*)	Power as a Multiple of 1 Spindle Power
1	122.6 Kw/s	1.00
2	175.0	1.43
3	203.8	1.66
4	222.6	1.82
5	235.4	1.92
6	245.3	2.00
7	251.3	2.05
8	257.6	2.10

-16- .

Figure B

The power or capacity of a central processor is a function of the instruction mix and other architectural considerations, such as I/O load, pipeline characteristics, buffer hit ratio and virtual memory address translation. The Institute for Software Engineering has expended a substantial effort developing controlled experiments to calibrate the power characteristics of IBM 30 series and compatible CPUs. Both software experiments and hardware monitoring experiments have been designed and run. The results are routinely published in the Institute's *CPU Power Analysis Report.*

The central processor or central processors in a configuration have an absolute power which is most easily obtained by direct measurement with a hardware monitor. In software physics, it is easily shown that this power is expressible in terms of an instruction mix, such as the old Gibson mix. In practice, since the instruction mix will vary slightly with the workload, an average power value is most useful to use, and this is generally all that is needed.

The maximum theoretical throughput power of a configuration is equal to the sum of the powers by equipment class or, equivalently, the sum of the CPU power and I/O power by channel subconfiguration. For an ideal configuration, the I/O power is the sum of the control unit subconfiguration powers by equipment class. For other than an ideal configuration, the effective I/O power of the control unit subconfigurations as degraded by multiple-channel connections must be used.

As an example, consider a simple configuration with one 3330 disk control unit subconfiguration, made up of eight drives, on channel 1, operating in a non-RPS mode with an average block size of 4,096. By the previous calculations, the maximum I/O disk power is 258 Kw/s.

Similarly, assume a set of eight 3420 Model 3 tape drives in a single control unit subconfiguration on channel 2, with an average block size of 6,000 bytes. Its capacity is 102 Kw/s. If the CPU is an IBM 370/158, assume the average CPU power is 8,000 Kw/s.

Ignoring the printers, card readers and so forth for simplicity, the configuration capacity or theoretical throughput power is the work that can be done by it in one second. That is:

cpu work/sec = 8000 Kw/s
disk work/sec = 258 Kw/s
tape work/sec = 102 Kw/s
total capacity = 8360 Kw/s

The ideal workload for this assumed configuration would be able to utilize all of this power. Thus, it would result in complete overlap of all equipment classes and operate all at 100% utilization. Note, however, that the channel 1 "percent utilization" would be less than 100% because the channel device is not busy during disk seek.

The software work unit vector for the ideal workload is easy to calculate. Since the total work in one second is 8360 Kw, the ideal workload vector is equal to:

$$unit\ vector = \begin{bmatrix} cpu & : & 8000 \div 8360 \\ disk & : & 258 \div 8360 \\ tape & : & 102 \div 8360 \end{bmatrix}$$

$$= \begin{bmatrix} .957 \\ .030 \\ .012 \end{bmatrix}$$

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This unit vector in conjunction with the total work per second characterizes the ideal workload for the equipment.

The techniques briefly presented in this section permit one to determine the capacity or power inherent in any configuration or subconfiguration. The word "capacity" is often used in this sense, but it is often also used in a second and different sense. This is illustrated in the phrase "we are out of capacity" when used to mean "we can no longer meet response time or service level requirements."

This other meaning of capacity is a function of three parameters: the inherent equipment capacity; the size and other characteristics of the workload or application; and the response time or service level time arbitrarily specified. Although the full software physics treatment of this topic is beyond the scope of this article, the next section will briefly consider the basic concepts.

Throughput & Response Time Prediction

The problems of predicting throughput, service levels and response times in general are treated in software physics as problems of providing sufficient equipment power to a workload or application to obtain a desired elapsed time. Elapsed time is also a function of the degree of execution overlap between CPU and I/O. The problem is thus often one of increasing I/O power (or decreasing I/O work) because I/O is usually the largest portion of unoverlapped execution.

Software physics claims to be a general theory. This claim requires that techniques and methods which are successful and which originate outside of the context of software physics be integrated into the theory. Because of the power of the theory, when this is done many useful new capabilities are usually added to the techniques in question.

In the area of throughput and response time prediction, this integration has been done rather completely. Two general methods have been in use for some time: 1) the systems profiles generated by many software and hardware monitors and 2) queueing theory techniques as embodied in central server models and more directly the continuous form (operational analysis) of these techniques pioneered by Jeff Buzen.

Both approaches have been thoroughly unified into software physics and are considered at least by the Institute to now be an integral part of the general theory.

Although the system profile techniques appear to be quite different from those of operational analysis, in fact they only represent a special and simplified case of the more general form of Buzen models. That is, the system profile techniques demonstrated below are essentially an "open model" in the more general theory of software physics operational analysis models. Both methods are still useful, though, because of the relative ease of obtaining data for profiles compared to the more general models.

Systems Profile

Since the system profile approach clearly demonstrates how workload and processor/server characteristics are separated in the software physics approach, it will be considered first.

The classic systems profile is given in terms of CPU busy and channel busy data. Software physics uses a slightly different form, called an "execution time profile." An execution time profile is quite similar to a normal systems profile, except that as always in software physics "any device busy" times for a subconfiguration are used rather than channel busy times.

An example is the best means of explaining the techniques involved. The normal simplifying assumptions and the configuration described previously will be used for the example. However, in practice the actual procedures and detail used are quite similar, so the example is a realistic representation of the overall methodology.

The procedure usually begins with:

(1) Obtaining an execution time profile by equipment class.

(2) Concurrently measuring or calculating the work done by equipment class. In conjunction with the times from the execution profile, this gives both the absolute and relative power usage levels of the equipment classes.

Assume this has been done, and that an execution time profile (Figure 4)

(Continued on In Depth/14)

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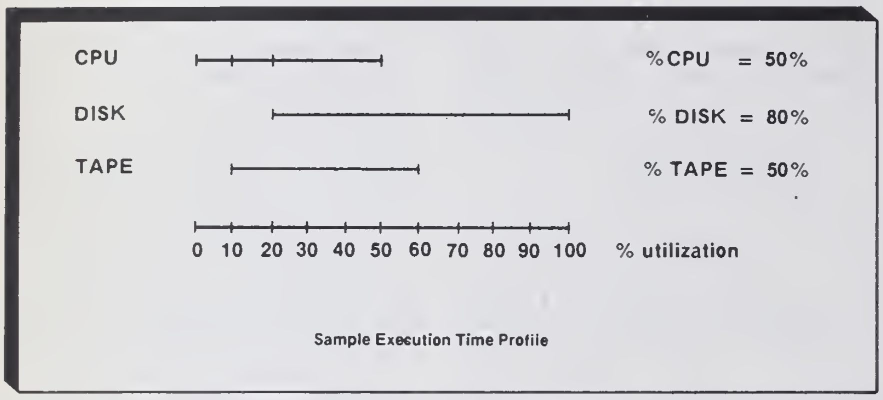

Figure 4

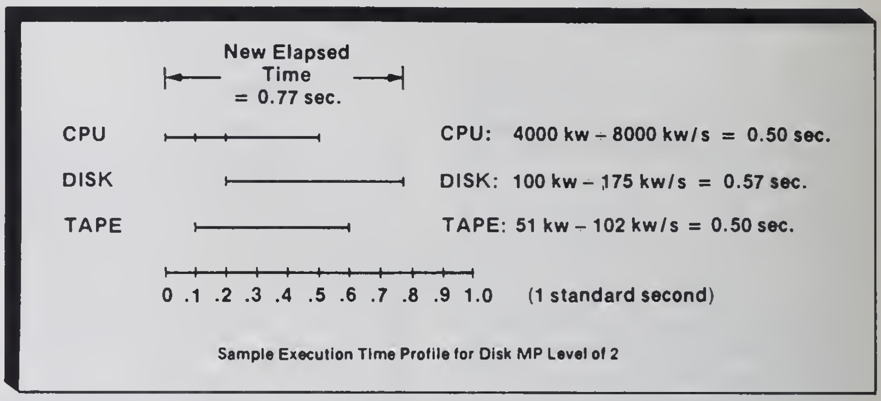

Figure 6

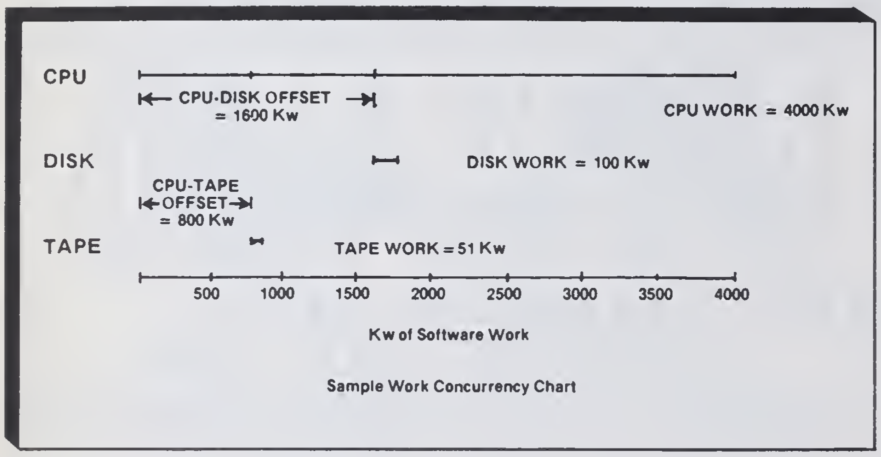

Figure 5

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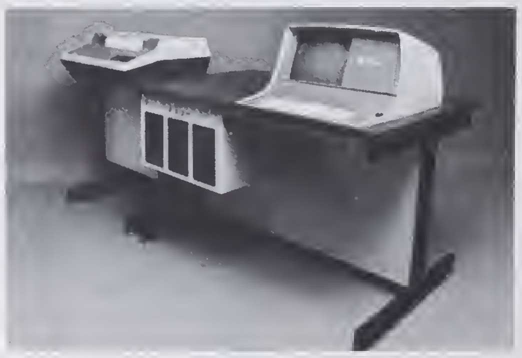

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(Continued from In Depth/13)

was obtained for the 158 configuration previously described.

Assume further that the tape work done was observed to be 54,000 units per second of elapsed time; i.e., the absolute tape power was 102Kw/s corresponding to a block size of 6,000 bytes. Assume the disk work was observed to be 100Kw of work per second of elapsed time. Since the percent utilization was measured as .8, the absolute power = 100 ÷ 0.8 = 125 Kw-s, or slightly more than "one spindle power" under non-RPS operation with the assumed block size of 4,096.

The CPU power is assumed to be 8,000 Kw/s, so the CPU work done in a second of elapsed time is (0.5) (8,000) = 4,000 Kw. The total work done in this second is (4,000 + 100 + 51) = 4,151 Kw, so the throughput power is 4,151 Kw/s.

The execution time profile shows that the work by equipment class is not competely overlapped. A certain amount of CPU work must be done before any disk work can be done, and likewise for tape work. This work is called a "CPU-offset." The CPU-disk offset, from the profile, is (0.2) (8,000) = 1,600 Kw, and the CPU-tape offset is (0.1) (8,000) = 800 Kw.

Concurrency Chart

The execution time profile can now be converted to a corresponding work concurrency chart. Such a chart represents the amount of work done in one second of execution time and shows the overlapping or concurrency with which the work by equipment class can be performed. Taking into account the CPU-offsets, the work concurrency of Figure 5 is obtained from the execution time profile by multiplying the equipment class times by the observed power usage levels.

This work concurrency chart can now be used to evaluate the impact of either equipment changes or performance improvement activities. Alternately, it can be used to define a configuration which will operate at some desired level of throughput power.

Taking the first use as a further example, consider the impact of raising the disk multiprocessing level to two spindles from the level of one spindle as observed. Better scheduling techniques might well accomplish this. The new disk power for an average 4,096-byte block size would then be 175 Kw/s instead of 125 Kw/s. Since time = work ÷ power, dividing the work concurrency chart disk work value by the new power and dividing the remainder by the old and assumed unchanged powers gives the execution time profile shown as Figure 6.

The new elapsed time is equal to the CPU-disk offset time of .2 seconds plus the new disk time of .57 seconds, or .77 seconds. Since the quantity of work done has not changed, the new throughput power is equal to:

throughput power is equal to: 4,151Kw ÷ 0.77=5,391Kw/s

The percentage improvement in throughput is therefore:

% throughput
improvement = (5,391 - 4,151) ÷ (4,151)
= 29.9%

The predicted new percentage utilizations can also be calculated. These are calculated by dividing the new times to do the work by the new elapsed time. Doing this, one has:

new % cpu utilization = 0.50 ÷ 0.77 = 65%
new % disk utilization = 0.57 ÷ 0.77 = 74%
new % tape utilization = 0.50 ÷ 0.77 = 65%

If either the disk power usage level can be increased beyond 175 Kw/s, or if the CPU-disk offset can be reduced, the limiting factor on throughput will quickly become the tape power. Obviously, the impact of going to 3420 Model 5 drives or some other power level can equally well be evaluated.

Given a workload forecast in the form of a software work vector, and a set of CPU offsets that are reasonable from historical or other data, a work concurrency chart may always be constructed. Specification of an elapsed time to process the work then becomes equivalent to specification of both the overall throughput power required and the absolute power required within each equipment class.

This is essentially a specification for the required installation capacity. Comparison of these powers to observed power usage levels and to theoretical power levels then permits development of a combined equipment and performance improvement plan to meet the projected workload requirements.

Accurate Predictor

This simplified approach has proven adequate to quite accurately predict the elapsed time of benchmarks run on identical configurations except for CPU changes. Clearly, however, it has little direct applicability to the problems of on-line response time prediction. As mentioned, this is because the

(Continued on In Depth/16)

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DP Dialogue

Notes and observations from IBM
that may prove of interest to
data processing professionals

Answering the Concerned Citizen in Long Beach, California

In some cities and towns, the questions and concerns of citizens are to a degree like the weather. Everybody talks about them, but nobody does anything about them. Not in Long Beach, California, though. Thanks to a computer, residents need call only one telephone number to be connected to the right department and be guaranteed a response.

People who answer the phones use IBM computer terminals to display a list of information areas ranging from consumer protection and senior citizen services to animal regulation and sidewalk repair. After finding the right category, they can see a display of various kinds of questions and put the caller through to the responsible department.

Up to this point, a well-indexed directory might serve just as well. But from here on, an IBM System/370 Model 158 helps keep queries and concerns from becoming serious problems.

According to John Dever, City Manager of Long Beach: "The computer automatically prepares a letter to each caller, which is hand signed by a city official. The letters thank callers for their interest, tell them which department is handling their calls and provide a reference number if there is need for correspondence or an additional call. The system lets us track each inquiry as an open item until we've made a complete response. We get a statistical analysis of the kinds of complaints we receive and periodic reports for city management. The analysis helps us spot problems in their early stages and act to remedy them."

The citizens of Long Beach, California, are proud of their sparkling new civic center. And they're pleased with their city's computer-based system for answers to questions and concerns about city services.

The Information Management System/Virtual Storage (IMS/VS), an IBM program product, is used with computer programs written by the city. The system is designed to update information quickly. Changes become immediately available at the terminals as soon as they are added to the computer data base.

"We publicized the system heavily and got 700 calls the first two days," says Dever. "We're running slightly below 100 calls a day since then. And we've received questions and expressions of interest from over 100 other cities, including some outside the U.S.A. Perhaps most important, citizens who have used the system tell us it's been needed for a long time."

At Roche Clinical Laboratories, ADRS Passes the Test

"Users are getting the answers they need – promptly," says Kim C. Frank of Roche Clinical Laboratories, Inc. "With ADRS, people throughout the company are solving their own problems without our help, and our programmers are free to concentrate on our primary business systems."

Frank is operations/technical support manager of the Raritan, New Jersey, subsidiary of Hoffmann-La Roche Inc. A leading clinical laboratory, RCL accepts blood and other specimens from physicians in many states and performs the tests they order. An IBM System/370 Model 148 collects the test results and transmits them via telephone links to IBM 3770 Communication Terminals in 24 regional offices.

Many Users

Users from managers to secretaries at RCL have learned to work with A Departmental Reporting System (ADRS), an IBM program product that enables them to structure a wide variety of reports and analyses. A data interface program lets them write ADRS programs that take advantage of existing computer files.

"Since we have a small programming staff, we can't always respond to users' needs fast enough," Frank notes. "Now managers, professional people and secretaries invoke ADRS themselves directly through 3277 Display Stations."

Among the personnel using ADRS is James P. Halligan. As director of distribution services, he is in charge of the field organization that collects the samples from local offices and then transports the finished reports from the regional facilities to the local offices. He uses ADRS to analyze route structures for a fleet of 225 vehicles.

Good Management Tool

"It's a tremendous management tool," he states. "We've improved gas utilization, done travel-time studies, prepared budgets, and tracked costs and revenues. The system stores anything I want – lists of drivers' names and addresses, vehicles, routes, and collection stations. And airline schedule data. We can shape the information as people need it. We invest less time and get better information."

In the purchasing and material control department, people use ADRS to track the consumption of supplies, analyze the materials costs of specific tests, and maintain purchasing and vendor files. Still other active users are found in the payroll, finance, security and maintenance departments.

"Some of these applications," Frank says, "would have taken months if developed conventionally, by system analysts and programmers."

Blood specimens are prepared for thyroid function test. Managers at RCL do their own planning and analysis, with the aid of IBM's A Departmental Reporting System (ADRS).

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(Continued from In Depth/14)

technique is essentially an open model in operational analysis or queuing theory terms. On-line systems normally require a closed model form of representation along with different assumptions on work arrival rate characteristics. In the Institute's opinion, operational analysis techniques are the most effective available for this purpose.

In the classic formulation of operational analysis, the basic queuing theory formulas are rederived under the same assumptions of service time. Service time in software physics is a function of work and processor power characteristics. As a result, the software physics formulation of Buzen's operational analysis has additional capabilities which arise from the separation of the workload and processor properties.

In addition, all of the other capabilities of software physics theory are directly relatable to this reformulation of operational analysis. However, in the final analysis, work has simply been a translation of Buzen's original work and the Institute has always made this point quite clear.

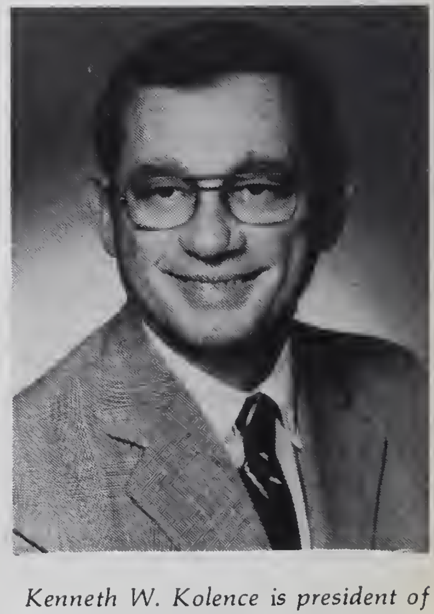
The literature on operational analysis is extensive. The interested reader is referred to perhaps the best single article on the topic, "The Operational Analysis of Queuing Network Models," by P.J. Denning and J.P. Buzen, *ACM Computing Surveys*, September 1978. In addition, the Institute regularly teaches courses which present the Denning/Buzen material in both its original and software physics forms.

Capacity management is a field whose technical foundations are under active development, with considerable progress already having been made. Its roots are clearly in the field of performance measurement and tuning, but capacity management is concerned with a much broader class of problems.

Unfortunately, the data collection or instrumentation available, such as SMF and RMF on IBM systems, is still closely oriented to performance tuning. As a result, the single greatest practical problem faced in implementing the various capacity management functions is obtaining consistent data for all workloads. These problems are being overcome gradually, and one can confidently project that the full benefits of capacity management will become widely available in the near future.

This has been but the briefest of presentations on the scope of application of software physics to the job of capacity management. The actual work accomplished to date covers many topics in addition to those presented here. Far more importantly, the work has been carried to the depth necessary for practical application to most real-life capacity management problems.

This detail, along with the necessary foundation material, is available in the Institute for Software Engineering Report Series and is supported by a variety of courses, case study write-ups and direct assistance. Because of the available detail, this paper should be considered as merely an introduction to software physics and its applications.



Kenneth W. Kolence is president of the Institute for Software Engineering in Palo Alto, Calif.

Kolence is best known for his contributions to the field of computer measurement. He is the originator of software monitors, having invented the original Boole & Babbage products PPE and CUE. He is also a winner of the A.A. Michelson Award, named for the original developer of software physics theory.

On April 28th, our Special Report on Source Data Entry will give you the input you need on OCR, key-to-disk, and the problems of data entry.

Edited by Jay Woodruff and Tom Henkel, the first half of this Special Report is a consumer guide to OCR and key-to-disk systems. Included will be lists of popular vendors in these data entry fields and a comparison of the packages they offer.

The second half of **Source Data Entry** will feature tutorials and application stories describing:
- The problems and drawbacks of OCR systems and the 10 best ways to improve them.
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Including Small Business Systems

Show Sees Mix of DP, WP Introductions

By Jake Kirchner
CW Washington Bureau

ATLANTA — Aimed at a mix of DP and word processing (WP) applications, a number of products ranging from modems and CRTs to small stand-alone business computers made their first appearance at the Office Automation Conference here earlier this month.

Commodore Business Machines, Inc. of Santa Clara, Calif., unveiled its CBM 8050 5.25-in. dual floppy disk drive, offering 1M byte per disk for $1,695. The company also showed a 300 bit/sec modem for $395.

Targeting the WP desktop DP market, Commodore introduced its 8000 series of intelligent terminals, available in a 16K model for $1,495 and a 32K version for $1,795. Featuring a 2,000-char. CRT screen of 25 80-column lines, the 8000 series generates 64 Ascii characters and 64 graphics characters within an 8 by 8 dot matrix, the company said. The terminals use Basic and operate in interactive and program modes.

Lexitron WP System

Lexitron Corp., the Chatsworth, Calif. unit of Raytheon Data Systems, announced at the conference its Raytext WP system, a configuration of stand-alone Lexitron VT word processing terminals sharing a systems controller and disk files.

With minimum configurations starting at $63,450, the Raytext systems are based on a systems controller featuring 128K bytes of MOS memory and supporting up to 10 Model 1202 or 1303 VT terminals.

The Raytext systems will support up to four 80M-byte disk drives on-line for 252 million characters of text file storage, the company said. An IBM 3270 emulator supports interactive communications with a host mainframe.

Text Processor

Another product shown at the conference was a text processing system from Dictaphone Corp. consisting of a CRT, a remote printer and a disk module. The 66-line by 102-char. CRT is augmented by a 37-char. single-line plasma display unit for prompts, command verification and single lines of text.

The Dual Display system is priced at $15,950 including a 40 char./sec bidirectional daisy-wheel printer. Additional workstations are priced at $2,995.

Included within a number of small business systems demonstrated by Basic/-Four Corp., Santa Ana, Calif., was a new full-page intelligent WP terminal, designated Dataword II.

Dataword II is an enhanced configuration for use on the Basic/Four System 410, a spokesman said. It consists of one multifunction 15.5-in. CRT terminal that can display a full 8.5- by 11-in. page of text using 64 lines of 80 char. each.

Dataword II also includes a 45 char./sec printer. Together, the terminal and printer cost $12,500.

Micro Business System Offers Multiuser Option

WESTLAKE VILLAGE, Calif. — Smoke Signal Broadcasting (SSB) has introduced its 6809-based series of Chieftain Business Systems that include multiuser and 20M-byte hard disk options.

The system is configured around SSB's Chieftain microcomputer with 64K bytes of main memory and the DCB-4 disk controller, which handles four 8-in. floppy disks, each storing 1M bytes of data. The hard disk provides 10M bytes of removable storage and can be accessed by up to four users.

The system incorporates a 6809 microprocessor that allows users to run application programs written in Basic at what the company clamed is 2.5 times the speed of comparable 6800-based computers.

Additionally, the Chieftain series supports Cobol, Fortran and UCSD Pascal.

Programs available for business applications include payroll processing, inventory control, accounts payable, order entry, accounts receivable, invoice entry and general ledger.

Up to 16 64K-byte blocks of memory can be addressed, allowing up to 1M byte of memory to be accessed. To meet specific requirements, the entire 1M byte can be configured into 4K blocks.

The Chieftain Business System's basic configuration includes a 1,920-char. CRT terminal and either a high-speed line printer or daisy-wheel printer. Its price ranges from $5,000 to $8,400, depending on disk storage and printer, the vendor said from 31336 Via Colinas, Westlake Village, Calif. 91361.

Development/Debug Tool Ready for Intel 8088 Users

ALOHA, Ore. — Intel Corp. has introduced an in-circuit emulation module for its 8-bit 8088 microprocessor.

The ICE-88 emulator provides the capability to develop and debug application hardware and software when combined with the firm's Intellec microcomputer development system and 8086/8088 software development package, the company said.

Intel's 8088 microprocessor, introduced earlier this year, has the full 16-bit architecture of the 8086 plus an 8-bit data bus interface that is compatible with 8085 support and peripheral components.

The ICE-88 emulator provides user testing and debugging capabilities and links the Intellec system with the user's system through a buffer box and cable that replace the 8088 CPU during debugging and testing.

The ICE-88 software allows the user to halt emulation under program control under a variety of conditions. Following the halt, the ICE-88 software can return control to the user or perform debugging tasks.

The emulator automatically disassembles the results either of a trace of execution or directly from the program memory, thus converting the binary object code into assembly mnemonics intelligible to the user.

The ICE-88 also implements command macros.

All debugging functions use symbolic names to refer to pertinent data, variable or program locations within the user's software, thus eliminating the need to keep track of absolute addresses for them. Programs developed with the 8086/8088 software development package provide the ICE-88 emulator with symbols for the symbolic debugging feature.

The ICE-88 module costs $5,500, the vendor said from 3585 S.W. 198 Ave., Aloha, Ore. 97005.

On-Line Mini Helps Bank Save $35,000

Marquette National Bank Vice-President Edward Kohler looks on as clerk uses one of four terminals in the bank's on-line minicomputer system to gain immediate access to the status of any trust account.

MINNEAPOLIS — Cashing in its outside software package for an in-house turnkey minicomputer system, the trust department of the Marquette National Bank here saved nearly $35,000 in the first year of the system's operation.

By freezing departmental operating costs, the on-line system is expected to increase annual savings from $35,000 last year to $100,000 by the end of 1985, according to Vice-President Edward Kohler. Any growth over Marquette's present 800 accounts and $260 million in assets will therefore mean accelerated profits.

The system from National Computer Systems, Inc. (NCS) incorporates a Texas Instruments, Inc. 990/10 minicomputer with 192K bytes of memory, two 200M-byte disk drives, one magnetic tape drive and a 600 line-min Control Data Corp. printer. Four TI 911 hard-wired terminals and NCS' Trustware

(Continued on Page 56)

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Businesses on the move are choosing *Silent 700* Portable Data Terminals as compact traveling companions. The Model 745 Portable Data Terminal weighs only 13 pounds and uses a standard telephone and electrical outlet to communicate with a host computer. The lightweight Model 765 Portable Bubble Memory Data Terminal takes orders all day, and can then save on communication costs by transmitting at night when phone rates are lower.

The new 780 Series Data Terminal models feature TI's state-of-the-art dual-matrix printhead for 120 characters-per-second virtually silent thermal printing.

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TI is dedicated to producing quality, innovative products like the *Silent 700* and OMNI 800 Electronic Data Terminal Families. And TI's hundreds of thousands of data terminals shipped worldwide are backed by the technology and reliability that comes from over 30 years of experience in the electronics industry.

Supporting TI's data terminals is the technical expertise of our worldwide organization of factory-trained sales and service representatives, and TI-CARE†, our nationwide automated service dispatching and field service management information system. That's why TI has been appointed the official computer and calculator company of the 1980 Olympic Winter Games.

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TEXAS INSTRUMENTS

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'You've Got to Have a Computer Nowadays'

Turnkey Helps Florida Firm Keep on Truckin'

TAVARES, Fla. — A turnkey minicomputer system geared for motor freight statistics is helping a trucking company here move through truckloads of paperwork and keep track of rapidly escalating costs.

"You've got to have a computer nowadays," J.M. Booth, president of Booth Trucking, Inc., stated. "We used to project all of our operating costs for a full year, but now we've got to do it monthly — if not daily. We'd go out of business in a short time if we couldn't keep up."

Booth Trucking recently purchased a Moore Business Systems (MBS) 20/50 small business computer with software designed for the trucking industry. The MBS 20/50 was introduced by Moore Business Forms, Inc.'s Dallas subsidiary late last year and is the firm's first venture into the business systems market.

"In a long-haul operation, the two figures you ultimately need for cost analysis are revenue per mile and cost per mile," Don Webb, the trucking firm's accountant, stated. "We've figured it manually in the past by listing on sheets of paper every single load hauled by state of destination, but it took weeks. In that time, the information became stale."

Four-Year Wait

Webb recognized the need for a computerized accounting system in 1975, but had to delay purchasing a system for four years because of several factors. When he first investigated available computer systems, the hardware was considerably more expensive and considerably larger in size than systems available today, he said.

In addition, obtaining the software programming that would meet the company's special needs would have been too expensive.

"There was also the problem of communicating our needs to the software people. They can give you what they think you need, but it may not meet your requirements," Webb said.

"In our situation, there was just no economy of scale," he added. "We couldn't afford the computer system, but we couldn't afford to do without the information."

Booth Trucking, as most small-and medium-sized carriers, also could not afford to hire the quality of in-house expertise that it needed.

"What we needed was an alternative — an information system that was productive and complete enough to provide sufficient data for me, the accountant, but also uncomplicated so that the existing clerical staff could operate it," Webb recalled. "So we waited and had to be satisfied with outdated and incomplete information."

Helpful Support

The alternative appeared last year, when MBS introduced the 20/50. After carefully determining the company's special needs and requirements, Moore installed the system in the Booth Trucking office.

Moore's technical staff and its motor freight industry manager, Lee Haskin, were particularly helpful in installing and explaining the system and training the Booth staff, according to Webb.

Instead of adding personnel to use the MBS 20/50, the company was able to spread the work load and eliminate some time-consuming subsidiary records, such as cash receipts and shipper billings. Webb estimated that the system so far has reduced the office work load by 25% to 30%.

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Mini Saves Bank $35,000 in 1979

(Continued from Page 53)

software complete the configuration.

Kohler had considered six other vendors, but opted for the NCS Trustware system because of "the performance it delivered for the price."

This makes the third major operating change for Marquette's trust department in the last eight years. In 1971, Marquette had 10 people handling its 560 trust accounts and $43 million assets. But the department's manual processing was buried in a blizzard of paper.

So the department turned to an outside software package, with processing done by the bank's DP center. But costs escalated arithmetically as Marquette acquired new trust business, since charges were based on number of entries.

By 1978 these charges were already up to $6,500/mo; Kohler could see them hitting $100,000 annually by 1985.

More pressing were the growing problems of obsolete software: "We had no way to handle common trust fund accounting, no way to analyze account performance, no way to allocate costs or contributions of employee funds."

The problems of escalating costs, long delays and accelerating growth of Marquette's trust business forced Kohler to look at three automated solutions:

- Off-line processing using a different purchased software package, with processing done locally.
- On-line processing at a remote location using an outside processing service.
- On-line in-house processing, giving Kohler's department complete control of data input and processing.

Kohler's first option — changing to another software package — would have meant a heavy initial investment ($75,000 to $100,000). In addition, Kohler calculated his DP charges would run $5,000/mo to handle the existing work, not including IRA/-Keogh pension work.

Monthly charges for Option 2 — remote on-line processing — would have been roughly comparable to the first option.

Kohler chose Option 3. With its own on-line in-house Trustware system, Marquette has frozen operating costs.

Difference in Costs

Trustware costs $5,200/mo for Marquette's setup. Under the former system, the direct DP costs were $3,200/mo, plus $125/mo for software updates, $150/mo amortizing the original software package, $600/mo for special projects and overtime and $200/mo for service bureau charges.

On top of those costs was a $3,300/mo charge for outside IRA/Keogh processing (slated to jump to $4,200/mo this year). Finally, by switching to Trustware, Kohler moved one person, saving another $800/mo.

With the IRA/Keogh conversion, Trustware will save Marquette $3,000/mo. In 1979, Kohler estimated outside IRA/Keogh processing would have cost $50,000: with Trustware he was able to do it in-house for less than $15,000, turning a $50,000 cost into a $35,000 saving.

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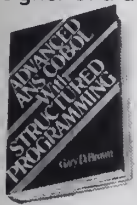
"Publishers Weekly" called this book ". . .a rare look into the next 20 years of computer development. . .by 20 of the computer world's top authorities. The concept of an emerging information society, as opposed to the industrial or agrarian society of old, is the underlying unity of the book. The essays range broadly across an exceptional variety of issues yet they are insightful and specific rather than merely descriptive." $25.00

IC130 **Application Design Handbook for Distributed Systems,** by Robert Patrick.

An excellent handbook for the practicing systems analyst, this book is a state-of-the-art approach to the mechanics of computer application design and an organized compendium of application design hints. It's a non-mathematical treatment based on firm data processing principles, and provides basic coverage of human factors, performance, distributed data and systems availability concepts that must be considered during the evolution of a successful design. Addresses economics of distributed computing and includes a checklist of 95 activities to be considered by the designer of a distributed system. $19.95



WJ143
Advanced ANS COBOL with Structured Programming, by Gary Brown.

This book does not deal with the elements of programming, but goes right to its task: teaching the basics of COBOL and simplifying many of COBOL's advanced features, including sort-merge, character string manipulation, report writer, indexed and direct files, communications facility and others. Emphasis is placed on structured programming as a way to simplified programming. $21.50

BP132 **Personnel Management,** Sang Lee and Cary Thorp, editors.

A guide to the use of computers in personnel management. Includes a description of the nature of Personnel Information Systems, the role of time-sharing and consulting services, legal problems and more. $15.00

JW129 **Fundamentals of Data Communications,** by Jerry Fitzgerald and Tom Eason.

An introductory book for people with little previous knowledge of data comm. Includes discussion of hardware, design methods, network configuration and control concepts. $18.50

CS122
Learning Level II, by Dr. David A. Lien.

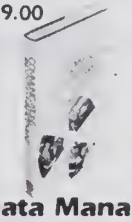
This book covers Level II BASIC on the TRS-80, including a special section on converting Level I programs to Level II. It does not require a knowledge of Level I, however. It explores every important BASIC capability in detail, with the emphasis on learning how to use it, including the Editor, dual cassette operation, the real-time clock, printers and other peripherals. $15.95

BP134 **Data Processing Training Handbook,** by Gary Slaughter.

This book addresses the reasons for justifying DP training, how to justify it, and how to measure its effectiveness. It also assesses the readiness of your DP department to move ahead with a cost-effective training program by providing you with a means of analyzing the current status of your DP operation as compared to other formal DP training programs. $15.00

BE125 **Modern Project Management,** by Claude W. Burrill and Leon W. Ellsworth.

A comprehensive book about data processing application development, presenting a project methodology designed to assist all levels of management in their efforts to achieve productivity, quality and worker satisfaction. $39.00



WJ141
Communications and Data Management, by T. Walton.

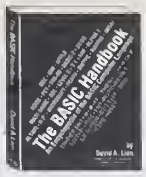
"How to establish an ideal information systems plan for your organization." This information planning handbook helps you implement an overall, long-range data management plan insuring adequate information at low costs and giving you improved performance, improved user enthusiasm and improved cost-efficiency. $24.95

BP133 **Electronic Communications Systems,** William C. House, Editor.

A comprehensive group of articles on the new and exciting communication systems available through electronic means. Subjects covered include: Basic Communication Concepts, Network Fundamentals and Emerging Satellite and Packet Networks, Current Trends in Data and Word Processing, Expansion of Intelligent Terminal Networks, Key Telecommunications Applications. $25.00

PM124
Research Directions in Software Technology, edited by Peter Wagner.

Consisting of contributions from some of the most prominent researchers in computer science today, this book assesses the past, present and future impact of computer research on the development of software technology. Emphasizes the relation between theory and practice and the reliability of increasingly complex software projects. $24.95



CS121
The Basic Handbook, by Dr. David A. Lien, author of the TRS-80 Learner's Manual.

The publishers say that this book is an "encyclopedia of the BASIC language," that will help you "make those programs found in magazines work on your computer—or know the reason why they can't." If there is an alternate way to write a needed function that your machine doesn't have, this book will give you a subroutine to accomplish the same thing. If there is another way to write a program with different BASIC words, the book will show you how. $14.95

BP131 **Problem Solving: A Systems Approach,** by Robertshaw, Mecca and Rerick.

Shows how to zero in on problems, strip them down to key issues and then resolve them, using general systems principles. Uses many examples from various fields, including data processing, to involve you in real-world problem confrontations and the use of systems tools for their solution. $17.50

JW128 **An Introduction to Programming and Problem Solving with Pascal,** by Schneider, Weingart and Perlman.

This book will help you gain a firm working knowledge of the entire PASCAL language. It also teaches the fundamentals of programming in general, and an awareness of the importance of programming style. $15.50

WJ039
Microcomputers, by Wise, Chen and Yokely.

Find out how microcomputers may change and their future impact on society in this "technology forecast and assessment to the Year 2000." Includes microprocessors, memory, peripherals and software. $15.95

SC126 **Computers and Social Controversy,** by Thomas Logsdon.

This book examines the social consequences which the use of computers will eventually bring with it. Seven major areas are covered, including computers and privacy, crime, education, artificial intelligence, automation, consumerism and banking. $15.95

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Basic/Four Makes Changes In Two Systems

SANTA ANA, Calif. — Basic/Four Corp. has announced price reductions and system upgrades on its Systems 410 and 610 small business computers.

Prices were cut on the company's System 410 add-on disk capacity. Basic disk capacity on the 410 is 14M bytes, upgradable in 7M-, 14M-or 28M-byte increments to a maximum of 42M bytes. To upgrade from the 14M-byte to the 42M-byte capacity formerly cost $12,500. The same upgrade now costs $7,500, a spokeswoman said.

The System 610-S is a new system configuration designed to broaden the company's product line. A base System 610-S includes one CRT terminal, 64K bytes of memory, a 150 line/min printer, a 75M-byte disk drive and a dual-density 800/1,600 bit/in. magnetic tape drive.

The price of the 610-S is $65,400, the spokeswoman said, vs. $51,400 for the System 610 with its 160 char./sec printer and 35M-byte disk drive.

Basic/Four can be reached at P.O. Box C-11921, Santa Ana, Calif. 92711.

Quad-Size Controller Ties DEC Micros, Shugart Disks

GARDEN GROVE, Calif. — Distributed Logic Corp. (Dilog) has introduced an intelligent quad-size disk controller designed to interface Digital Equipment Corp. microcomputers with Shugart Associates, Inc. disk drives.

The Model DQ-201 interfaces DEC LSI-11, LSI-11/2 and LSI-11/23 microcomputers with 14.5M-byte Shugart SA4004 or 29M-byte SA4008 hard disk drives.

The controller can interface one or two disk drives to a single quad slot with DEC RKV-11/RK05 emulation and RT-11/RXS-11M compatibility, a spokesman stated.

The DQ-201, which costs $1,592 in quantities of 50, is available from Dilog at 12800-G Garden Grove Blvd., Garden Grove, Calif. 92643.

Based on CMOS/SOS

Lower Cost HP 1000s Configured

PALO ALTO, Calif. — Hewlett-Packard Co. has applied CMOS/silicon-on-sapphire (SOS) large-scale integration technology to produce a low-cost series of HP 1000s in new cabinetry.

The HP 1000-L Series will be offered as boards, rack-mountable processors or in systems for about half the price of HP's formerly least expensive HP 1000 computers, the company said.

Prices of boards begin at $2,250, while the least costly box version is $4,450.

Distributed Intelligence

Two SOS chips form a "distributed intelligence" architecture, with a one-chip CPU and a processor chip on every board. The L series are compatible with all other HP 1000s and have multiprogramming real-time executive operating systems, support program development in Fortran IV, Basic and assembler languages and execute Pascal.

The single-chip CPU on a single printed circuit board performs all of the computer's computation and control functions. Also integrated into the chip are the time-base generator and memory-protect features; these were separate boards on earlier HP 1000s.

The series is based on RTE-L, a new member of HP's real-time executive operating system family, which can supervise execution of multiple priority-ordered functions in the foreground while less critical operations share its swappable background processing area.

The L series systems are suited for instrumentation and process control applications, according to the manufacturer at 1501 Page Mill Road, Palo Alto, Calif. 94304.

DEC-Compatible Floppies Go to 1M Byte per Drive

NATICK, Mass. — Charles River Data Systems, Inc. (CRDS) has boosted the available storage of its double-sided, double-density Digital Equipment Corp.-compatible floppy disk systems to 1M byte per disk drive.

CRDS added optional Shugart Associates, Inc. SA850 double-sided, double-density drives to two existing CRDS products to create the MF-411 and FD-411.

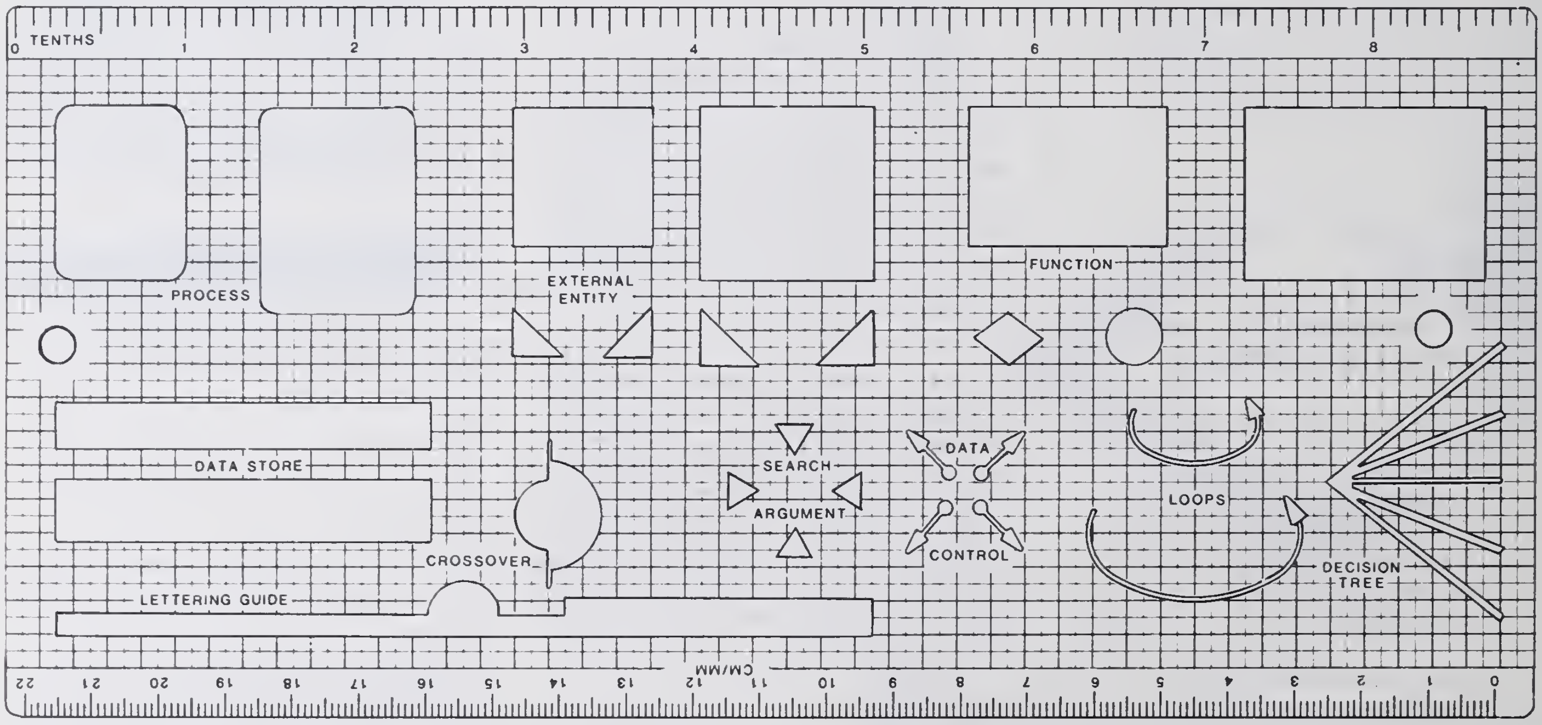
The MF-411 is a self-contained system that includes a DEC LSI-11/2 microprocessor, memory, power supply and two floppy disk drives. The FD-411 is an RX02-equivalent dual floppy disk drive add-on system.

Both systems are downward-compatible with DEC's RX02, the MF-211 and the FD-211, and single-sided diskettes may still be used in double-sided drives without modification.

To make use of the additional storage capacity of the double-sided drives, however, the user requires a modified handler supplied by CRDS.

Both the MF-411 and the FD-411 feature an interface controller card that contains all controller, interface and formatter electronics on a single dual-height card. The MF-411 with LSI-11/2, 32K words, controller, bootstrap loader, power supply, rack-mountable enclosure and front-panel console costs $6,930; the FD-411 system costs $4,250, the spokesman said from CRDS, 4 Tech Circle, Natick, Mass. 01760.

New template as Structured Analysis/Design aid



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Japanese Ready Semi Industry For VLSI

TOKYO — Japanese firms are investing heavily in expanded semi-conductor plant facilities, and a portion of the new investments are targeted for very large-scale integrated (VLSI) circuit productions, according to *EDP/Japan Report* (EDP/JR).

Research groups within both the Nippon Telegraph and Telephone Public Corp. (NTT) and the Ministry of International Trade and Industry (Miti) recently announced their latest VLSI accomplishments almost simultaneously.

While it will be some time before VLSI chips are commercially available, Japanese governmental units have recognized that the design of electronic equipment will change rapidly once VLSI becomes a key component in the industry. Accordingly, Miti and NTT recently made their VLSI patents available to the public, according to EDP/JR.

NTT, Miti Chips

NTT's VLSI advance is in the area of 256K-bit chips, which are "still in the stage of successful trial production in the laboratory," according to NTT.

Miti's VLSI Technology Research Association developed a 1M-byte chip using three instruments — high-speed electron beam lithography equipment, electron beam-based mask testing machinery and an electron beam transcriber. The equipment was designed by Miti's VLSI research group; the principal parts were manufactured by Toshiba Corp. and Akashi Works.

While the VLSI chips are still in the laboratory stages, the near-term prospects for commercially producing them has prompted both Fujitsu Ltd. and Oki Electronic Industry to acquire sites for VLSI manufacture, EDP/JR noted. The two firms expect to begin constructing the factories within the current fiscal year

In an attempt to spur national develop-

(Continued on Page 63)

Vendor Opens Hospitality Suite At Site of IBM Users Meeting, Threatened With Blacklisting

By Jeffry Beeler
CW West Coast Bureau

ANAHEIM, Calif. — Four directors of a large IBM users group allegedly threatened a small vendor with "blacklisting" after the company's president opened a hospitality suite in the same hotel where the users group recently held its latest meeting.

Marc Kaufman, whose fledgling firm builds IBM 3270 data cluster emulators, was advertising his hospitality suite through a closed-circuit TV network in the Disneyland Hotel here when four men identifying themselves as directors of Share International, Inc. approached him and demanded the ad's immediate withdrawal.

In their confrontation with Kaufman, the unidentified Share representatives branded the TV advertisement a violation of their organization's bylaws, which forbid outside vendors from opening hospitality suites in hotels where the users group is holding a conference. "They threatened to publicize the violation in Share's newsletter and, in so doing, ensure that none of their 1,500 member firms would ever buy my company's products under any circumstances," the president of Kaufman Research Management, Inc. recalled.

'Like Leaping in Front of Train'

Kaufman later agreed to withdraw his TV advertising, but refused to comply with Share's demand that he close the hospitality suite. Within a few days, however, doubts about the wisdom of his refusal began to weigh heavily on Kaufman's mind.

"I decided I didn't want my company to end up on the Share membership's bad side," he conceded. "Many of the group's members include organizations like [General Motors Corp.], [the National Institutes of Health] and [the National Aeronautics and Space Adminstration (Nasa)], and to get yourself blacklisted by such a group of potentially large customers would be foolish from a business standpoint, like leaping in front of a moving freight train."

So as a matter of expediency, Kaufman decided to make his peace with Share by writing each of its directors a letter apologizing for his actions at the Disneyland Hotel.

But although he describes himself as "contrite" about the hospitality suite incident, the company president refuses to believe he did anything unethical by making an unannounced appearance at the doorstep of Share's latest meeting. "As someone who doesn't belong to Share, I don't see why I should be expected to adhere to its bylaws," he said. "In fact, how could I even know those bylaws existed?"

Share: No Boycott

On the other side of the controversy, Share Vice-President Edward Hathaway denied accusations his organization is planning a formal boycott of Kaufman's firm and its products. But Hathaway did concede the possibility that a detailed account of Kaufman's hospitality suite caper might appear in an upcoming issue of Share's newsletter.

Hathaway, who in addition to his users group duties serves as a systems specialist with Nasa's Ames Research Center, accused Kaufman of "voluntarily and knowingly disregarding" Share's bylaws governing hotel hospitality suites — a charge the company president denies.

"We intend to make that disregard known to our members and let them decide for

(Continued on Page 62)

CSI Sees Worldwide Mini Sales Growing 32% Through 1984

SAN JOSE, Calif. — Revenues from worldwide sales of minicomputer equipment are expected to grow at a compound annual growth rate of 32.6% through 1984, according to the latest industry report from Creative Strategies International (CSI).

Within this thriving market, CSI sees the emergence of two trends — a rapid acceptance of 32-bit superminis and a decline in the percentage of sales made to the OEM sector.

By 1984, CSI projected, superminis will represent 10% of the shipments and 35% of the revenues of the minicomputer industry. The growing demand for these systems could be underestimated, particularly if IBM continues to stretch out delivery times for its 4300 mainframe line and delay such offerings as the System/38.

Revenues from the OEM sector will grow with the expanding marketplace, but surging end-user demand will tend to reduce both OEM revenues and shipments as a percentage of the total market, CSI said.

OEM revenues will represent 38% of the total worldwide mini shipments by 1984, down from 42% in 1979, CSI predicted. Shipments to the OEM market as a percentage of total shipments will fall from 67% to 64%.

End-User Sales

Sales to end users last year accounted for about 33% of the total unit shipments but close to 58% of the sales dollars. While the end-user market is more lucrative than the OEM market, the growing complexity of users' software needs requires that mini vendors target only a few specific end-user applications, CSI said. In choosing these target applications, however, mini vendors must exercise caution lest they begin to compete with their own system house customers.

Most mini makers minimize the risk of competing with their OEM customers by choosing an application that is growing rapidly enough to justify the risk, CSI observed.

Another risk in the market is the emergence of IBM in the mini arena. IBM has had a negligible impact in the mini marketplace so far, but CSI contended that IBM's Series/1 installed base is significant in both end-user and OEM segments.

(Continued on Page 63)

Fairchild vs. DG Must Go to Trial

SAN FRANCISCO — Data General Corp. and Fairchild Camera and Instrument Corp. must go to trial to settle a $30 million antitrust suit, the U.S. District Court for the Northern District of California recently ruled.

Fairchild, now a unit of Schlumberger Ltd., filed the suit against DG on Oct. 16, 1978. Fairchild's suit essentially charges that DG, through restrictive software licensing, unlawfully ties together the marketing of its software and hardware [CW, Nov. 6, 1978].

In making his decision, Judge William H. Orrick determined that DG did tie the sale of the operating system to the sale of the CPU, which affects a "not insubstantial amount of commerce in the market." The CPUs in question reportedly are DG's Nova 1200 and Nova 3.

Although no date has been set for the trial, it will probably take place toward the end of the year, according to a court employee. Among the issues in contention is whether DG has sufficient economic power in the operating system software market to restrain competition in the CPU market.

Fairchild's 9440 Microflame processor emulates DG's Nova 1200. Fairchild's suit claims that DG's position makes it virtually impossible for any supplier to manufacture a DG-compatible Nova product without infringing on a DG trade secret.

Several other companies have sued DG for similar reasons, and those suits have been consolidated into the Fairchild complaint. The other litigants are Digidyne Corp., SCI Systems Corp. and Bytronix Corp.

Ampex, Corp. which had filed a similar suit, settled with DG prior to the judge's ruling. Settlement terms were not disclosed.

DG declined comment on the court ruling.

DEC, DG Shipped 66% of Minis Sold to Resellers in '79: Directory

HUDSON, Mass. — Minicomputers from Digital Equipment Corp. and Data General Corp. comprised 66% of the shipments made to OEMs and other system resellers listed in Sentry Publishing Co.'s "1980 Directory of Systems Houses and Minicomputer OEMs."

DEC's share of the total 11,089 mini shipments comprised 46.2%, DG's 20.2% and the 34 other vendors garnered 33.6% of the shipments.

But during the year, DEC achieved a 6% gain in shipments to these resellers at the expense of other vendors — excluding DG — whose shipments declined by about the same amount.

The second edition of the directory includes 1,300 resellers, which includes about 45% of the nation's resellers, according to William Gannon, Sentry's publisher.

Shipment Increases

Shipments of minicomputers advanced only 5% from last year's shipment levels and comprised only 16% of total computer shipments.

However, shipments of microcomputers advanced 33% and small business systems increased 101%, according to Gannon.

Total unit shipments to resellers increased 33% to 66,546 units from 49,332 units reported in the previous year.

Four Categories

The directory divides resellers into four categories. Traditional hardware OEMs comprise 20% of the vendors listed. System integrators, which design and build systems requiring custom hardware, make up 30% of the listings.

System software implementers, comprising 18% of the vendors, adapt standard hardware to special applications. Finally, commercial OEMs and distributors, the largest class consisting of 32% of the listings, buy complete systems or products for resale.

In addition to the 1980 directory, which sells for $347, Sentry is offering for the first time a two-volume "Dataguide." The first volume, a manufacturer's directory, contains ˜ 2,000 listings of computer-related firms.

The other volume is a product guide, a "Yellow Pages"-type compendium segmenting products into 100 categories. "Dataguide," printed twice a year, costs $50 for a yearly subscription.

Sentry is located at 5 Kane Industrial Drive, Hudson, Mass. 01749.

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COMPUTERWORLD
Computer Business News
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Supershorts

A West Virginia federal court dismissed a $184 million patent infringement suit against Storage Technology Corp. (STC) brought by Potter Instrument Co. Potter's suit, filed last July, claimed STC infringed on two of Potter's computer tape equipment patents.

— — —

Univac has established a new semiconductor division and reportedly committed $50 million for a capital expansion program in Eagan, Minn., which would increase its large-scale integrated circuit capabilities.

Tomash to Retire

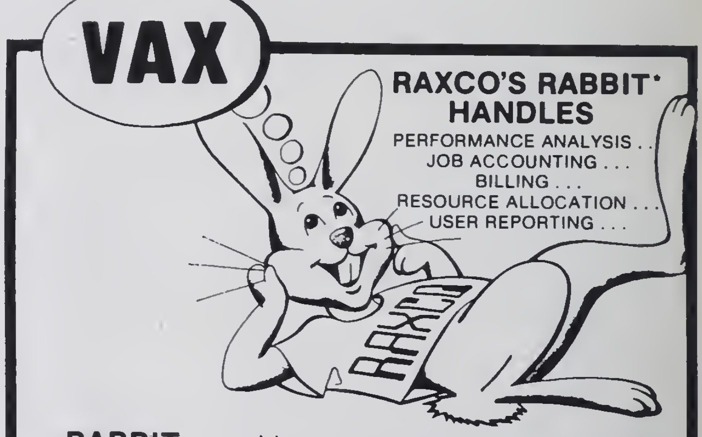
WOODLAND HILLS, Calif. — Erwin Tomash, founder and chairman of Dataproducts Corp., will retire from the day-to-day operation of the company effective April 16.

However, he will remain a director and continue as chairman of the executive committee in addition to serving as a consultant to the firm.

Graham Tyson, now president and chief operating officer, will succeed Tomash as chairman and will continue to serve as the firm's chief executive. Charles A. Dickinson, presently senior vice-president of operations, will become president and chief operating officer.

In another move, Robert G. Bartizal, executive vice-president, has resigned effective April 1 to form his own firm.

Tomash has reportedly been considering retiring for the past year. Although he will remain involved in the company's affairs, he intends to devote considerable time to the Charles Babbage Institute (CBI). CBI, which Tomash founded in 1977, is a nonprofit foundation for researching the history of computers and DP.



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Exhibits Set in Korea, Hong Kong

WASHINGTON, D.C. — Because Southeast Asia offers attractive opportunities for computer vendors, the U.S. Department of Commerce will sponsor in tandem two computer and peripheral exhibitions in Korea and Hong King this summer.

The first leg of the exhibition will take place at the Hyatt Regency Hotel in Seoul, Korea, July 7-July 11. The second phase is scheduled for the Furama Hotel in Hong Kong between July 14 and 18.

Exhibitors do not have to participate in both exhibitions.

Describing the market, Commerce noted that Hong Kong accounted for 34% of the total computer installations in Asia in 1978. Banks and financial institutions are the heaviest users of DP equipment, accounting for 29% of the computer installations, the Commerce Department said. More than 60% of local banks were being computerized in 1978 and 14 new banks became operable during that year.

After banks, service bureaus comprise the next largest group of users, accounting for 14.2% of the installations at the end of 1978. Transportation companies round out the top three, using 10.5% of the installed systems. Hong Kong is an important transport center in Southeast Asia and of the 269 transportation companies, 72 have installed small or medium-size systems.

Despite the growing number of computer installations, applications remain stable in Hong Kong, with 70% still limited to general commercial, banking and business purposes.

Leading Vendors

U.S.-made computers accounted for 77.6% of the $123 million worth of computers installed in Hong Kong at the end of 1978, Commerce noted.

During 1977 and 1978, the number of computer equipment suppliers increased from 19 to 31. While most new entrants are U.S. firms, foreign suppliers, particularly the Japanese, are heating up the competition.

IBM held 34.3% of the total dollar value of computer installations in Hong Kong at the end of 1978. Univac followed with 14.3% and Digital Equipment Corp., the third ranking U.S. company, held 7.7% of the market. NCR Corp. and Wang Laboratories, Inc. also made strong showings.

Korean Market

In Korea the annual market for computer and peripheral products is expected to double by 1984, expanding from $41.1 million last year to $84 million in 1983, according to Commerce Department projections.

U.S. vendors are expected to garner an 80% share of this market. Most users purchase complete packages from a single supplier rather than mixing and matching a variety of system components. In part this is because Korean users are skeptical about obtaining after-sales service.

Presently the largest user in Korea is the government, which as of June 30, 1979 had 38 systems of varying sizes installed. The government will continue to spend heavily for DP equipment, with expenditures topping $14 million annually by 1983.

Growing by 270% over the next four years, the banking industry will also offer excellent prospects and will spend $13 million annually for DP equipment by 1983.

Moreover, of 27 stock brokerage firms in Korea, only three have their own computers, leaving an obvious market for U.S. vendors, the Commerce Department concluded.

Details on the exhibitions may be obtained from Robert Wallace, U.S. Department of Commerce, OIM Room 6015A, Washington, D.C. 20230.

FPS, CII-HB Sign OEM Pact

BEAVERTON, Ore. — Floating Point Systems, Inc. (FPS) recently signed its largest OEM contract with CII-Honeywell-Bull, Inc. (CII-HB).

Valued at between $15 million and $20 million, the multiyear contract calls for the incorporation of FPS' FPS-100 arithmetic and AP-120B array processors into CII-HB's Level 6 equipment.

With the added computational power, CII-HB will be able to target new markets, in particular general scientific processing, image processing, satellite data processing and secure government intelligence programs.

Processor Speeds

The FPS-100 processor lets Level 6 Model 40s or 50s perform up to 8 million floating-point operation/sec and the AP-120B permits up to 12 million floating point operation/sec.

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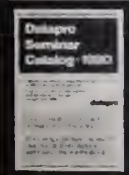

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Relief Issue Hamstringing Settlement

By Connie Winkler
CW Staff

NEW YORK — Settlement talks between IBM and the Justice Department on the U.S. vs. IBM antitrust trial apparently hinge on the question of structural relief or a split of the company, upon which the government has always insisted.

The new head of the antitrust division, Sanford M. Litvack, said recently that the Justice Department continues to seek "structural relief that would change the makeup of the industry."

Later, IBM's general counsel Nicholas deB. Katzenbach responded that IBM "will not negotiate on the basis of the structural relief which has been the government's objective in this litigation." Whether IBM would accept something less than structural relief remains open.

Little Progress

An IBM spokesman added that there have not been any substantive discussions, and "both sides realize any such discussions would be enormously difficult."

No additional talks have been scheduled. To date there have been three meetings between Attorney General Benjamin R. Civiletti and IBM, which one person familiar with the action described as deciding the shape of the peace table.

However, additional talks are expected. A Justice Department spokesman in Washington, D.C., said once the parties are down to substantive matters, they would know in two to three months whether talks are going anywhere.

This is IBM's longest statement to date on the negotiations, which were prompted by appellate court judge William H. Mulligan on Sept. 14, 1979. At that time IBM had asked the appeals court to remove District Court Judge David N. Edelstein because of his alleged bias against IBM.

Mulligan recently ruled Edelstein can hold on to his job chairing the massive trial [CW, March 3].

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Vendor Suite Brings Threat

(Continued from Page 59)

themselves whether they want to do business with such a company," Hathaway said. "If a firm doesn't have enough integrity to respect Share's policies and the values it stands for, I suspect it will be viewed by the membership to be unworthy as a business partner."

The dispute between Kaufman and the Share directors began during the week of March 3, which coincided with the start of the users group's latest meeting. Though not an owner of a large IBM mainframe, Kaufman decided to stay close to the meeting anyway in the hope of gaining a few new customers for his company's products.

To that end, Kaufman opened a hospitality suite near Share's meeting site in the Disneyland Hotel and, during the afternoon of March 5, began advertising the suite with the help of the hotel's closed-cicuit TV network. At about 10 o'clock the next morning, he was approached by the four Share directors, who complained about the ad without identifying themselves by name.

One of the directors, a representative of a large U.S. industrial firm, reportedly threatened to use his influence to make sure Kaufman's products were blacklisted in all his company's many divisions.

About an hour later, Kaufman claims to have received a "very panicky" phone call from the closed-circuit TV system's manager, who said he had been ordered by the hotel's "highest levels of management" to remove the hospitality suite advertisement.

Japan Seen Capturing 18% Of U.S. DP Market by '90

By Connie Winkler
CW Staff

NEW YORK — Japanese computer makers will have about 18% of the U.S. market by 1980, according to Dr. Henry Rosovsky, a Harvard University expert on Japanese economic history.

Testifying in the U.S. vs. IBM antitrust trial, Rosovsky said the Japanese computer share would be about equal to its current share of the U.S. auto market.

Rosovsky's quantification of the Japanese threat came in his next-to-last answer in two days on the stand. Rosovsky said generally the track record of the Japanese — based on their performance in textile, steel and auto industries — foreshadowed their success in computers.

"My testimony is not based on particular markets or particular products, but is designed . . . to suggest we should take the Japanese intentions [seriously]," he said. In the past, American and European companies have not done this, so Japan is now the leading industrial country in the world.

'A Kind of Religion'

"Growth has been a kind of religion . . . in post-war Japan. Certain industries have been targeted for particular growth," the economist said.

The computer industry has been targeted as a "national priority of the highest order," according to the dean of Harvard's arts and sciences faculty, who described at length why he believes the Japanese are successful. His reasons:

- The quality of the people, including homogeneity and socio-cultural tradition.
- Their capacity to save money and create capital for industry. Forty percent of the Japanese gross national product goes into capital formation vs. 20% in the U.S.

On cross-examination, Justice Department lawyer Don A. Resnikoff contended what has happened with Japanese manufacturers in the mature auto and steel industries will not necessarily happen in the infant computer industry. Rosovsky agreed there are barriers to entry to the American computer industry, but said it is a "mistake to assume anything else" than vigorous Japanese competition.

In response to Rosovsky's statements, Resnikoff presented two statistics: that 60% of computer systems marketed in Japan by Japanese-controlled companies are used there; and that 35% of the computers exported from Japan are manufactured by IBM Japan — indicating that Japanese computer exports are limited. Rosovsky again responded that he is not a computer expert on either technology, markets or products, but that those figures did not affect his theory.

Rosovsky said he was paid $13,000 to $14,000 by IBM for 11 days of work in connection with this trial and emphasized that IBM contributions to Harvard had nothing to do with his testimony.

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Japan's Semi Production Up Almost 12%

TOKYO — Japanese semiconductor manufacturers have operated at full capacity during the past fiscal year (ending this month), with the total value of production expected to reach $3.8 billion.

This is an 11.9% increase over the production level for fiscal 1978, according to *EDP/Japan Report* (EDP/JR). The heftiest growth rate has been in integrated circuits — particularly MOS chips, which registered a 41.8% production increase from last year, EDP/JR said.

While computer memory takes up 31% of semiconductor production, desktop computers and microcomputers each consume about 15% of the production output.

High demand for semiconductor products is causing Japanese computer makers to increase their 1980 investment for semiconductor plants, EDP/JR said. Nippon Electric Co. (NEC) recently added about $28 million to its originally projected budget of $67 million for semiconductor plants, and other computer makers are expected to follow suit.

Moreover, NEC, Hitachi Ltd. and Fujitsu Ltd. are expanding production facilities in Europe. Hitachi recently announced plans to open a wholly owned subsidiary in Germany that will begin operating in 1981. Fujitsu has been considering a plant in Ireland and NEC, with a plan already in Ireland, is considering another one there or in another location, most likely Scotland.

Japan Preparing for VLSI

(Continued from Page 59)

ment of VLSI technology and to ease U.S. — Japanese trade friction, both NTT and Miti made their VLSI patents publicly available for royalty fees. Last month, NTT opted to allow any domestic or foreign firm to use patents developed privately by NTT or jointly by NTT and Nippon Electric Co. (NEC), Fujitsu and Hitachi Ltd. The NTT group applied for nearly 1,000 VLSI patents during the past five years, EDP/JR reported.

Until last month, NTT made available only the patents developed by the three firms participating cooperatively in VLSI research.

Miti eased restrictions on its state-owned and private/state-owned patents recently. Miti's private patents, developed by its group of five participating firms, were made public a year ago.

The five participating firms, NEC, Hitachi, Ltd., Fujitsu, Toshiba and Mitsubishi Electric Co., have been exchanging patents with Texas Instruments, Inc. and IBM.

In all, EDP/JR said, Miti has applied for about 600 VLSI patents.

As part of the goal to make VLSI a commercial reality, NTT has invited companies other than the three established communications and computer equipment makers to participate in research and development projects "for the improvement of the VLSI integration level by one digit," EDP/JR said.

This joint research effort will start in the upcoming fiscal year, with Oki Electric, Matsushita Electric Co., Toshiba and Mitsubishi Electric Co. expected to participate. However, the three early starters in the VLSI field — particularly NEC and Fujitsu — are concerned their vested rights will be diluted, and relations between these conflicting interests will be a problem, EDP/JR pointed out.

EDP/JR, a newsletter, is published by International Data Corp., of Japan.

Mini Sales Seen Growing 32.6%

(Continued from Page 59)

While CSI would not disclose what number of Series/1 installations or percentage of the market it considers significant, it maintained that by the end of 1984, IBM will be fighting for the No. 2 slot in the mini market.

In 1978, Digital Equipment Corp., Hewlett-Packard Co. and Data General generated about two-thirds of worldwide mini revenues;in 1979 they generated about 65% of the revenues. CSI predicted they will pick up share again as production capacity is increased.

CSI's minicomputer report costs $1,195. The report is available from the firm in Suite 275, 4340 Stevens Creek Blvd., San Jose, Calif. 95129.

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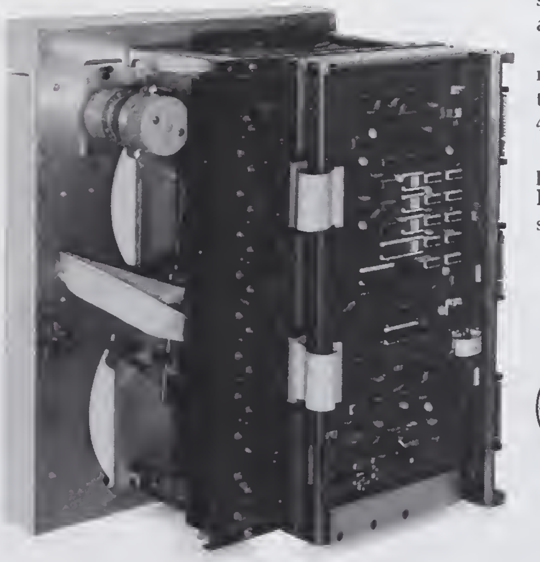

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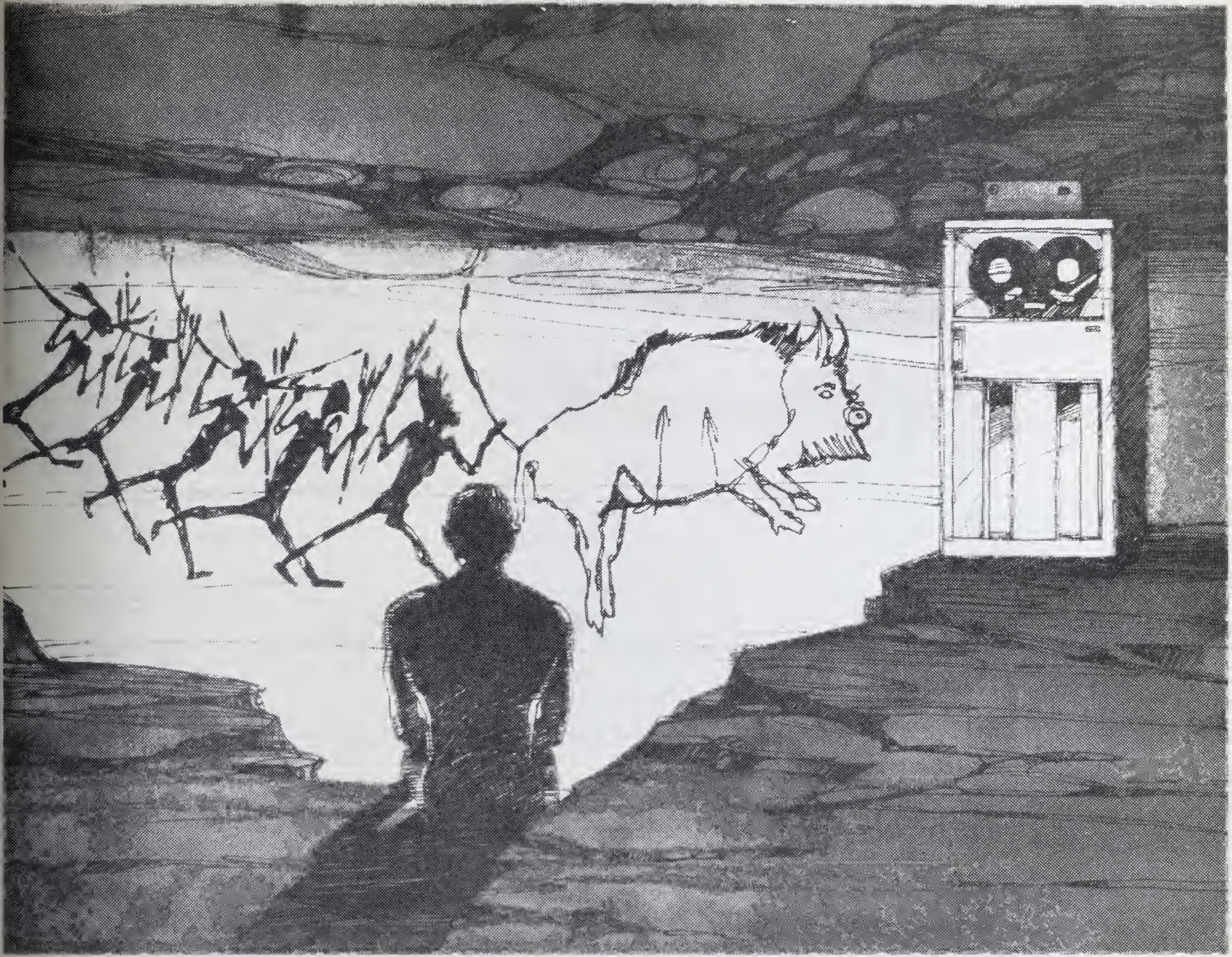

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Century Analysis, Inc. is the recognized leader in the field of teleprocessing and data management software for the NCR community. We are offering positions to aggressive, growth oriented professionals interested in pursuing careers in this vital, dynamic industry. Positions are currently open for Regional Marketing Managers in several major metropolitan centers nationwide and for Systems Software Specialists in our San Francisco Bay Area office.

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If you are a highly motivated systems software professional interested in leading-edge, state-of-the-art systems development, we can offer you:

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Computer Systems Division

Fort Lauderdale openings at Computer Systems Division where we design, develop, manufacture and market medium scale digital computers for the general-purpose scientific environment.

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Openings currently exist for a Department Manager and several Sr. Software Analysts in our home office Marketing Support Department. You will participate in pre- and post-sales support, benchmarking, software distribution, users' group activities and "hotline" support to Field Analysts. Candidates should have a degree in Computer Science or the equivalent and considerable knowledge/experience with some or all of the following: virtual memory operating systems, high-level languages, communications protocols, data-base architectures, multi-processing network and COBOL and Fortran. Specific experience with Harris computers and the VULCAN operating system would be a definite plus.

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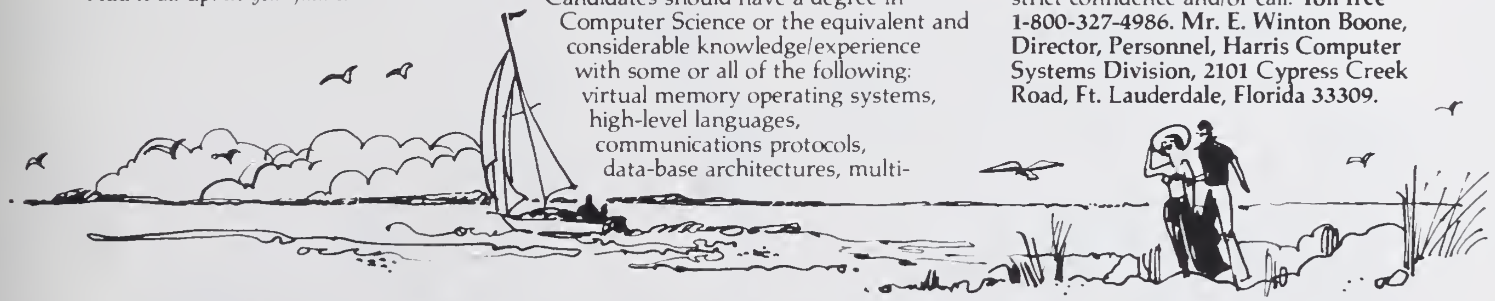
An opening exists for a Software Pro in our Product Marketing Department. Requires minimum of 5 years applicable experience in programming and/or supporting applications software for a scientific/engineering mainframe or a mini-computer vendor. Sales/Marketing experience in evaluating and acquiring external applications software packages is highly desirable.

Please send resume and salary history in strict confidence and/or call: **Toll free 1-800-327-4986. Mr. E. Winton Boone, Director, Personnel, Harris Computer Systems Division, 2101 Cypress Creek Road, Ft. Lauderdale, Florida 33309.**



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CALIFORNIA IS TOO EXPENSIVE

We admit it, housing on the West Coast is very expensive. Homes usually start in the $75,000-$100,000 range. Commute times are long, rents are high and entertainment costs rival New York. Then why come to California at all? For the simple reason that we have one of the most desirable climates in the country. Not to mention more recreation facilities, beaches, mountains and a casual lifestyle second to none. California *is* too expensive but we must be doing something right---because everybody wants to live here. Union Bank would like *you* to consider living here, too. Weigh the pros and cons; then check into the career opportunities at Union Bank in beautiful Southern California. Our current openings are for:

- **INTERMEDIATE PROGRAMMER ANALYSTS**
- **SENIOR PROGRAMMER ANALYSTS**
- **SENIOR PROGRAMMER ANALYSTS/PROJECT LEADERS**

Our LA Data Center houses dual 3032's migrating to MVS. This installation uses TSO/FSE and IMS in support of the development staff and our on-line network. We have two Data Centers in the S.F. Bay area, with plans to merge into one East Bay Center by 1981. Our present environment consists of one IBM 3031 running DOS/VS and two 360/40s running under DOS. We currently utilize COBOL and ASSEMBLER, as well as CICS, TOTAL, and CMS in support of the development staff and our on-line network.

Excellent starting salaries, a solid fringe benefits package, full relocation benefits and the satisfaction that comes from career fulfillment await the right individual. Forward resumes with salary history in confidence, or call collect:

UNION BANK

Data Processing Division
Bill Hilliard
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(213) 687-6482

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Olamic Systems Corporation invites sales professionals with at least 3 years experience in hardware or software sales to inquire about career oportunities in the following geographic areas - Atlanta, Boston, Chicago, Denver, Houston, New York and San Francisco.

Your background should include a successful track record in developing new business and maintaining customer relations at peak satisfaction levels. Candidates selected for this ground floor opportunity will form the foundation upon which our plan for rapid growth will be based.

Sales Responsibilities will include:

- Direct sale of network software products produced by our Software Publishing Division.
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Please address personal data to:

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And we can offer much more. SUN INFORMATION SERVICES COMPANY, (SIS) is a wholly owned, independently operating subsidiary of Sun Company, Inc. (Fortune 50). We are less than 5 years old and are in the top 1% of all D.P. service firms in size. SIS is growing due to a combination of market acceptance for our products plus the aggressive utilization of our creative expertise to develop new and successful systems for industry and business, nationally. Expansion has created the following openings in these locations:

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We seek seasoned pro's who will open new accounts and maintain and grow an established account base. We seek the kind of aggressiveness and expertise that will generate and maintain immediate new business.

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We can offer you a technically challenging environment conducive to rapid growth, an excellent salary and benefits program among the very best in the industry, plus high visibility responsibilities where you can utilize your expertise and make positive contributions to both the company's and your own advantage.

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Ed Preusser
CHICAGO, ILL.
(312) 951-8340

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- **TECHNICON offers a small company atmosphere, a large machine on-line programming environment & a commitment to professional growth.**

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You will be responsible for developing hardware specifications for equipment used in the medical information system. You will also evaluate and provide hardware design for external sources & provide technical assistance for new & existing customer contracts. Position requires experience in hardware digital circuitry design and/or system integration of computer equipment. Your ability to document procurement specifications and technical descriptions and interface with outside vendors necessary.

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Challenge yourself with this newly created position as a Systems Programmer. You will work with our applications programming specialists and our data center staff in the investigation, planning & installation of new IBM hardware & software and new TECHNICON software. Position requires 3-5 years experience with DOS/VS system programming & maintenance. Knowledge of Power/VS, RJE, DOS/VS Sysgen, ALC & your good communications skills are essential; exposure to COBOL & VM 370 desirable. Leadership and problem solving abilities are keys to this opportunity.

TECHNICON is a company with long-term, stable growth, competitive salaries and comprehensive benefits. Please send your resume, including salary history, or contact Rita Olds in our Personnel Department, at TECHNICON, 3255-1 Scott Blvd., Santa Clara, CA 95051, 408/727-9400.

TECHNICON
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SALES REP

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Requirements include

- Experience in Direct Sales to the End User community with emphasis in Data Communications
- Understanding of Data Processing Software and Hardware is desirable.
- Minimum of 3-5 years sales experience with a proven track record
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PARADYNE offers a competitive benefits program and realistic opportunity to maximize your personal and financial growth in a dynamic, expanding market place Please contact

Tom Kelly/District Sales Manager
(203) 624-2499

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Bakersfield, California, based farming company seeks Programmer/Analysts to assist in a five year development plan involving the automation of a variety of farming related systems. Applications will be written in Cobol to operate RJE to a IBM 370-158 Operating System running under MVS.

Minimum three years experience as a Programmer/Analyst and be proficient with Cobol and OS-JCL. VSPC and Panvalet along with Structured Analysis, Design, and Programming techniques helpful. Send resume and salary desired to Personnel Dept., P.O. Box 9594, Bakersfield, CA 93389. Equal Opportunity Employer

PROGRAMMER/ANALYST

Farming company based Bakersfield, California, seeks Programmer/Analyst to maintain and develop RPG-11 applications for IBM System 32 and 34. Excellent benefits. Send resume and salary desired to Superior Farming Company, Personnel Dept., P.O. Box 9594, Bakersfield, CA 93389. Equal Opportunity Employer.

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The result of dynamic growth, internal promotions, and state of the art development has created two exceptional positions within our corporate System Software Development Group. We offer unique challenges and visible rewards in a large scale IBM environment for a results oriented, highly motivated Systems Software Professional. The individuals we seek should be ready to assume a management position within a relatively brief time period with responsibility to direct the corporate efforts as it relates to IMS/VS, Data Dictionary, Inquiry IMS, and the design and implementation of a distributed telecommunications network.

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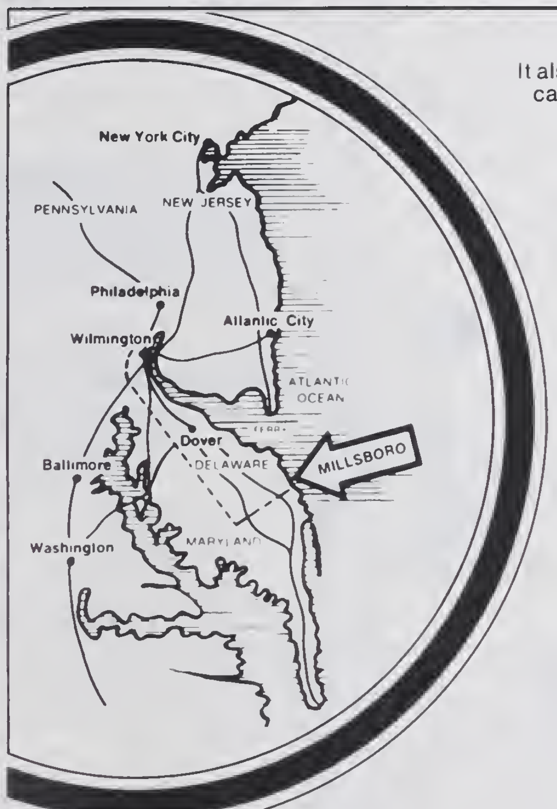
NCR-Millsboro means joining the leader in completely programmable POS terminals.



It also means a more demanding, more professionally satisfying career environment. It means ground floor opportunities in the design and development of our new C-2140 ECR/POS multimicroprocessor-based retail system—and the next-generation mid-range computer systems it will use. It means other long growth cycle projects.

If this, combined with computer access . . . high internal visibility . . . good internal communications . . . refreshing lifestyle . . . and joining a fast-expanding operation in a top computer company sounds attractive, investigate these immediate openings promptly.

Engineering Programmers

With knowledge microprocessor programming (8080 Assembly language); knowledge OS and data processing systems, and 1-4 years of pertinent firmware experience.

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Develop and implement test procedures to evaluate the reliability of hardware and software design of retail POS terminals to include communication protocols. Requires BS in EE or CS and knowledge of microprocessor hardware and software.

Project Planning Coordinator

To monitor projects at all stages. Will assist project managers in planning, scheduling specifications and documentation; chair R&D reviews; correlate budgets; interface with corporate product management. Broad systems engineering background needed.

Technical Writers

Will be responsible for creating, organizing, maintaining publications for retail systems products. Should have 1-3 years of technical writing experience in an engineering environment.

Components Engineer

To select, evaluate, characterize integrated circuits, generate procurement specs; be liaison to purchasing, production, QA and vendors. BS/MSEE, 5-10 years experience—1-2 in MSI/LSI applications preferred.

R&D Engineers

Senior Design Engineers in Mass Memory Hardware to design and test a microprocessor based memory system utilizing dynamic RAM technology. Appropriate degree and 5 years related experience necessary.

▪ ▪ ▪

Learn more about our professional and living environments by calling (302) 934-8111 Collect, or by sending confidential resume and salary history to: Mr. Ron Tull, Dept. R50 , NCR Corporation, Engineering & Manufacturing, Mitchell Road, Millsboro, DE 19966.

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International consulting firm seeks an analyst, preferably with college degree and 2-4 years of installation experience to work under EDP manager. Prefer some manufacturing exposure, know COBOL, RPG II. Familiar with minicomputers or IBM TP environment. Looking for a go-getter. Salary to low $20's, commensurate with experience. Include salary history. All replies handled in confidence. Write to:

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Harrah's

Harrah's Computer Systems Department is expanding and qualified persons are needed to fill the following positions:

Senior Programmer/Analyst (four years experience in data processing field with thorough knowledge of COBOL and IBM 360/370 hardware and system software)
Programmer (two years experience in data processing with working knowledge of CICS and COBOL)

Please send resumes, in complete confidence, to **Harrah's Personnel Office, P.O. Box 10, Reno, Nevada, 89504.**

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Los Angeles is a city of glamour, stardom, sunshine, beaches and beauty. It is also one of the country's major centers for data processing.

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INFORMATICS can offer you an exceptional opportunity for a truly challenging growth environment with exposure to current state-of-the-art technology on a daily basis. Excellent salaries and benefits provide a highly desirable compensation package.

An exceptional opportunity is yours for a new lifestyle in sunny Southern California. Once you experience the palm trees, Disneyland, the warm relaxed atmosphere of Los Angeles, the weekends at the beach - sailing, surfing, boating...you'll love Southern California!!! Interested applicants should call Mickey Johnson, COLLECT, (214) 696-1900 or send resume.

INFORMATICS, INC.
Professional Services Operations West
10300 N. Central Expressway, Bldg. II
Suite 167
Dallas, Texas 75231
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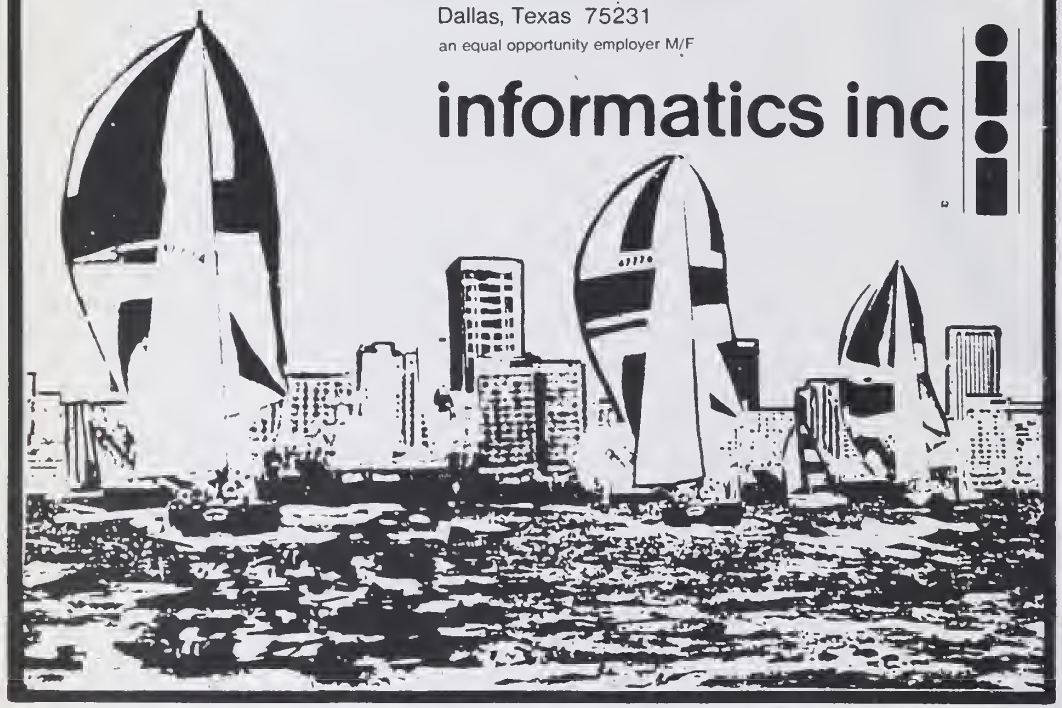

informatics inc

MICROCOMPUTER SOFTWARE ENGINEERS AND SYSTEMS PROGRAMMERS

Here is your opportunity to take advantage of ground-floor challenge while working on state-of-the-art microprocessor systems. System Development Corporation, Products Group, has senior positions available for Software Engineers and Systems Programmers with microprocessor experience, preferably Intel 8085-8086. Duties will include design and implementation of software for:

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Take advantage of SDC's excellent environment for professional growth and mail your resume today. SDC also offers outstanding benefits which include 4 weeks paid vacation the first year of employment, Educational Reimbursement, Management Development Training and Internal Technical Training. For confidential consideration please mail your resume including salary history or call:

NANCY PHILLIPS
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**System
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Equal Opportunity Employer M/F

PROGRAMMER ANALYST

We currently have an employment opportunity for an individual interested in a career in Data Processing. Major duties include maintaining transaction controlled languages, making changes to systems software coordinate installation of new hardware and research data communication problems. Ideal candidate should have three or more years of experience in programming on large Burroughs systems and detailed knowledge of major banking applications. This position offers excellent growth potential, a competitive salary, and comprehensive benefits package. If you meet the above requirements and are interested in joining a progressive company send resume with salary history in complete confidence to:

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Richmond, VA 23260

An Equal Opportunity Employer

Bank of Virginia

DATA PROCESSING OPPORTUNITIES

Georgia Power Company has immediate openings available in its Management Information Systems Development Department. These positions require a degree in information systems, computer science, math or engineering along with specified experience.

FINANCIAL SYSTEMS ANALYST

- **18 Months to 4 years experience in Systems Analysis and Design.**
- **Experience with accounting applications**
- **Programming and Data Base Management, preferable but not required.**

TECHNICAL SYSTEMS ANALYST

- **18 Months to 4 years experience in Systems Analysis and Design**
- **Experience with Engineering Applications**
- **Programming and Data Base Management preferred but not required.**

We are offering a competitive salary commensurate with experience, excellent benefits and great advancement opportunities. Please call or send resume to:

John Holly
Manpower Planning and Placement
Georgia Power Company
P.O. Box 4545
Atlanta, Georgia 30302
(404) 522-6060, Ext. 3707

Equal Opportunity Employer M/F

Georgia Power

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Here is your opportunity to design and/or code new approaches to operating systems, compilers, text processors, and communications software.

We are looking for career minded individuals who want to tackle the challenge of microcomputers in the 1980's. Assembly language experience is a must. A BS degree is desirable.

Radio Shack offers a challenging, project oriented work environment, a complete benefit package, and as much responsibility as you are willing to assume. Beginning salary is commensurate with experience. Long range salary depends on your initiative and ability to develop quality products.

If you are ready to join the leader in microcomputer development, send your resume in confidence to:

**J.J. Mintz, Employment Manager
Radio Shack/Division of Tandy Corporation
500 One Tandy Center
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Interactive Data Systems

Distributed Computing Utility

This worldwide network of computers is being implemented to provide a flexible, user-oriented, on-line and interactive environment, that integrates computer systems and data networks. The Distributed Computing Utility will support transaction processing, interactive computing, database management systems, and electronic mail and funds transfer services.

These services will be delivered by a system architecture that employs VM/370, CMS, and guest operating systems running on 4300 and 303x series processors.

If you are a qualified systems professional who has built and supported user-oriented on-line or interactive systems, and have at least three years of experience in one of the following areas, you may be interested in this challenging, state-of-the-art effort.

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◆ CP, CMS, and/or RSCS experience with internals, enhancements, distribution and production system support.

Interactive Office Systems

◆ Electronic mail, communicating word processors, text processing, and office automation and integration.

Interactive Applications and Systems

◆ Interactive and on-line database systems, multi-user applications, development of tools and utilities, user consulting and support.

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The DCU network represents a major systems architecture being implemented by the Bank to meet its corporate computing requirements through the 1980's. In addition to participation in this significant undertaking, the Bank offers an excellent environment, very competitive salaries and benefits. Positions are available in San Francisco with opportunities for either international travel or assignment. Responsible results-oriented individuals will receive comprehensive training, project challenge and financial support.

If this challenge interests you, please send your resume to Charles B. Smith, Manager, Recruitment Services, Bank of America, Dept. #3411-DCU, P.O. Box 37000, San Francisco, CA 94137. We are an equal opportunity employer.

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SYSTEM IMPLEMENTOR
SPANISH SPEAKING

Holland Chemical International Limited is looking for a freelance consultant who has worked for at least five years in Data Processing, with at least three years experience as a Programmer/Analyst Implementing Business Data Processing Applications.

The person we are looking for will be responsible for implementing our standard minicomputer based software package in our subsidiaries in Spanish-speaking countries.

The ideal candidate will:

- **Be willing to travel extensively**
- **Have experience using EDX COBOL/IAM/MTM on the IBM series/1 minicomputer**
- **Have lived in a Spanish-speaking country and be able to speak and write fluently**
- **Have experience installing new systems and training system users**

The initial contract will be for one year. After an introduction period our "Systems Implementor" will be responsible for coordinating and carrying out local conversion and user training activities in Spain, and subsequently in Venezuela.

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Send resume with professional references to **Corporate Systems Manager, Holland Chemical International LTD., P.O. Box 1888, Hamilton 5, Bermuda.**

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Federal Data Corporation, a leading Distributor of Texas Instruments computer terminal and peripheral equipment, seeks ambitious, highly motivated sales representative. Candidate should have two or more years of solid experience selling and/or leasing TI, DEC, LSI, IBM or similar equipment to Federal Government and Commercial accounts in the Washington D.C. area. Exception career opportunity for talented marketing professional to realize financial goals. Compensation package includes Salary, Commissions, Company car, Profit Sharing and other excellent benefits. To arrange an interview call or send resume to:

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Emphasis: Conceptual design, development and implementation of simulation models, mathematical, statistical and/or operational research systems in exploration and mining. Minimum of three years' administrative experience required.

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Emphasis: Computer applications in Geologic Exploration, Mining Engineering, Mining Operations and Geo-Statistical ore reserve evaluation. A minimum of three years' administrative experience is required.

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Emphasis: Development and implementation of scientific systems or programs in areas of geologic exploration, mining engineering, and inter-active graphic systems.

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If you want to be part of the effort to achieve energy independence and would like to join an expanding scientific computing team, send your resume in confidence with salary expectations to: **Bill Jackson, Morrison-Knudsen Mining Group, P.O. Box 7808, TAD 0840, Boise, Idaho 83729** or call **Bill TOLL FREE at (800) 635-5000.**

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4601 North Park Avenue
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Director of Data Processing — A Bachelor's degree in Business or Data Processing is required with a Masters prefarred. Candidetes should possess 4-5 years responsible experience including the supervision of a Date Processing Unit. Current knowledge of Sparry-Univac 9030 System would be helpful. Duties include the design of Data Bases for administrative and academic applications; Supervision of input, operating and programming functions; and organization and control of the college computer operation. Salary $16,711 — $23,581/yr (dependant upon experianca).

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Please send resume, in confidence, to Steve Eldridge, Human Resource Department, Computervision Corporation, Productivity Systems Division, 100 Commerce Way, Woburn, MA 01801.

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Background should include experience in design and implementation in OPERATING SYSTEMS; ON-LINE INTERACTIVE SYSTEMS FOR IBM 3270 and 3790; HONEYWELL VIP's, or BURROUGHS TD 800; COMPILER DEVELOPMENT; DATA ENTRY SYSTEMS and MINICOMPUTERS. BS in Computer Science or related fields is required along with assembly language knowledge. Solid experience with minicomputer and microprocessor systems plus familiarity with structured design and programming techniques preferred.

SR. MANUFACTURING ENGINEER

BSEE with 3+ years design and manufacturing experience for development of specific product lines. Must be people oriented and have the ability to work well with all levels of company personnel.

PRODUCT ASSURANCE ENGINEERS

Hardware and software knowledge related to the computer industry and a BSEE or Computer Science Degree is required. Responsibilities will involve qualification of testing final products consisting of terminals and distributed data processing systems.

SYSTEMS ENGINEER

BSCS with MSEE or BSEE with MSCS required. 5-10 years hardware, software and system design experience in the computer industry necessary. Knowledge of real-time development and microprocessor hardware essential.

SR. PROGRAMMER ANALYSTS

BSCS or related field required. Must have 3+ years business application experience using COBOL on large IBM systems. Prior financial systems experience necessary.

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Please reply in confidence by resume to Gary Siegel, Harris Corporation, Data Communications Division, Department CW,. P.O.Box 400010 MS #26, Dallas, Texas,75240.

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The Fibre Drum Division of Continental Forest Industries is looking for a Programmer/Analyst to join its MIS staff. The ideal candidate will have 1-2 years experience programming PDP-11 minicomputers using Basic-Plus under the RSTS/E operating system. A Bachelor's degree is desirable, as is experience in a manufacturing environment.

The ideal candidate will gain broad-based experience in this position; he or she will be given opportunities to work in many different areas of specialty, and will get to deal with all levels of management and staff personnel. Some travel will be involved in the job. This position will provide excellent exposure and opportunity for advancement.

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EDP PROFESSIONALS

COME TO THE FAIR

DMA will hold their second 1980 Data Processing Job Fair at the Biltmore Hotel in Los Angeles on March 30th from 10AM-6PM and March 31st from 10AM-8PM. Positions at all data processing levels are open.

★★★FREE ADMISSION★★★

Partial list of companies attending:

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Pre-registration is not required, however, if you send us your resume, we will provide a copy for each company in attendance.

Attention DP Managers and Recruiters: There are a few booths still available for our March job fair.

Data Management Associates

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Operations Manager IBM 370/168, 3033	**$25K**
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Two or more years experience with IMS/VS DB/DC in a large scale MVS environment as an IMS systems programmer. Knowledge of IMS INTERNALS and MVS is desirable. Familiar with problems in IMS application programming and data base design. Will be responsible for installation and maintenance of IMS online systems and related products.

Responsibilities may also include investigation of new software releases, IMS systems tuning, and support of operations, data base administration, and data support groups. Please mention JOB #020380.

Send resume to: Standard Oil Company of California, Professional Employment Office, P. O. Box 3495, San Francisco, CA 94119.

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PRINCIPALS ONLY

CHARLOTTE, NORTH CAROLINA Data Processing Opportunities

BarclaysAmericanCorporation, a dynamic, growth-oriented financial services organization, located in Charlotte, NC, seeks several data processing professionals. Individuals with at least an undergraduate degree, qualified to assume leadership positions in the development and implementation of sophisticated management information systems are needed in the positions for which the requirements are outlined below:

SENIOR SYSTEMS ANALYST

- A minimum of 5 years of experience in programming and systems analysis and design utilizing an IBM System 370.
- A background in financial systems and a working knowledge of COBOL and BAL.
- Experience in teleprocessing, modeling and forecasting is desired.

SENIOR PROGRAMMER ANALYST

- A minimum of 4 years of experience in programming and systems analysis and design utilizing an IBM System 370 and proficiency in COBOL.
- Ability to design and implement computer applications and to handle complex programming assignments.
- A background in financial systems, plus experience in teleprocessing, modeling and forecasting are desirable.

SYSTEMS PROGRAMMER

- An undergraduate degree and a minimum of 1 year of experience (beyond initial training) as a systems programmer, utilizing an IBM System 370.
- Experience generating and installing DOS/VS or CICS/VS releases, in addition to providing technical support for application development.
- Experience in VSAM file access methods and Power/VS and RPG programming language are desirable.

If you meet the above requirements and are interested in a challenging career in a delightful location, please forward your resume, Including salary history, to:

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P.O. Box 31488
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- Design on-line data base systems utilizing the Univac 1100 computer. Minimal programming is involved. A BA or BS degree is required, preferably in Business or Computer Science. It is essential that you have at least 2 years systems analysis experience and 2 years background in design on accounting applications. Must have the ability to interface well with all levels of management.

- Assignments will include programming of on-line data base systems utilizing the Univac 1100 and our minicomputers. A BS degree in Business Administration or Computer Science is required. Must have a minimum of 4 years COBOL business applications programming. Exposure to data base and real-time systems would be additional assets.

SOFTWARE QUALITY ASSURANCE

Position responsibilities will include product quality analysis, commercial software test planning, documentation reviews and project coordination. Requires BSCS and at least 3 years experience with operating system software and on-line commercial applications. Additional background should include knowledge of at least 3 high level languages including COBOL and ability to prepare technical and administrative reports, as well as assume technical responsibility for small projects.

SOFTWARE SUSTAINING

- Perform maintenance of COBOL compiler and runtime and provide technical liaison for TOTAL database problems. Requires a BSCS or equivalent experience and familiarity with compiler structure. Knowledge of COBOL and data base would be helpful.

- Perform maintenance/enhancement of Data Com software and general maintenance of operating system executive modules. Requires a BSCS or equivalent experience as well as knowledge/interest of Data Com.

- Position will provide general maintenance of operating system related software with emphasis in coding high level language. Requires a BSCS or equivalent experience and knowledge of PASCAL coding. Background in Data Base would be helpful.

OPERATING SYSTEMS

Several positions available from entry to senior level for individuals to participate in the design and implementation of components for our VORTEX operating system. Requires a BSCS and a minimum of 2 years experience in operating systems development. An MS and knowledge of PASCAL would be additional assets.

A position with Mini-Computer Operations offers you a stable, rewarding career, accompanied by a compensation package that is second to none in the industry. **Submit your resume and salary history in complete confidence to the address below, or phone Employment at 714/833-2400, Ext. 250, for additional information.**

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Programmer

Systems Analyst/ Programmer

St. Lawrence University has an opening for a Systems Analyst/Programmer. We are seeking an individual with COBOL experience, demonstrated ability in designing and implementing on-line systems and a business background. The university is a small liberal arts college located in the Adirondeck Foothills of northern New York. We are currently involved in a major computer upgrade. Closing date for applications is April 15, 1980. **Send resume and salary requirements to: R.E. Booton, Director of Personnel, St. Lawrence University, Canton, N.Y. 13617.** An equal opportunity employer m/f.

Data General

OPERATING SYSTEMS PROJECT MANAGER

Data General, a leader in the design and manufacture of computers currently has an opportunity for an aggressive, results-oriented individual with strong technical and managerial skills to join a ground floor development project. The individual we seek will be a major force in the design of a large, virtual timesharing operating system for a multiple CPU environment and will impact the direction of the project from its inception to release.

In taking the leadership of this project you will: work with state-of-the-art tools and high level languages developing an operating system suited to commercial applications; deal with multi-computer environments, distributed processing and general timesharing; and interface with hardware groups designing necessary extensions to contemporary computer architecture.

Your qualifications must include at least 7 years in software development with experience in timesharing operating system development using structured design techniques. Small group leadership is required and development experience in high level languages would be helpful.

We offer a competitive compensation package, including stock options. Send your resume in strictest confidence to:

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We are also seeking a programmer/analyst with 1 - 2 years experience in the design and implementation of on-line application programs using CICS/VS. Knowledge of BAL and/or FCL (financial communication language) would be considered a plus for this position.

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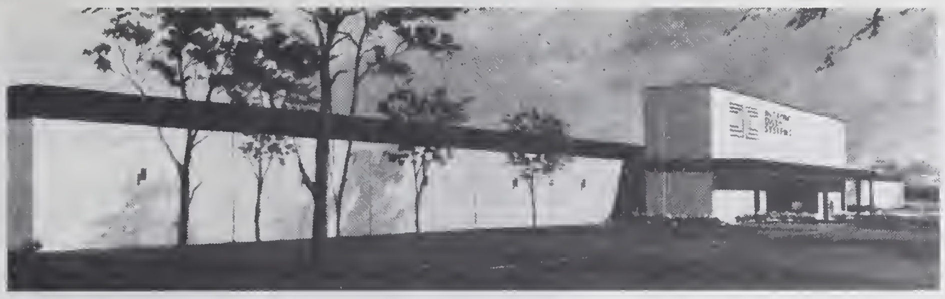

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PARADYNE is continuing to enjoy record tecnological achievements and growth in the Data Communications industry. To further support these developments, we are actively seeking a creative Systems Programmer. This key position is at our Corporate Headquarters in Largo, Florida.

To assume major responsibilities within the marketing support area, the successful candidate will rely upon a thorough, in-depth knowledge of IBM DOS, DOS/VS and DOS/VSE Supervisory programs. Effective verbal and written communications skills are required. Experience within the telecommunications field would be a definite plus.

We offer a competitive salary to start, a liberal benefits program and opportunities to advance your career in this fast paced industry. Please submit your resume, in confidence to:

Mr. Steve Hoskins
Technical Recruiter

paradyne

Paradyne Corporation
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If you would like to be part of this team, contact Mrs. Joy Blanchette at 603/224-5311, or, send your resume with salary requirements in strict confidence to:

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Concord, New Hampshire 03301
Attention: Mrs. Joy Blanchette

Senior Programmer Analyst

National corporation with financial and real estate interests is seeking a computer professional - minimum 2-4 years experience. Skilled in COBOL, IBM JCL and utilities RPG II useful. Online systems, interactive processing or timesharing experience desirable Financial, accounting or direct mail background helpful Supervisory experience a plus

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Design and implementation of high-speed, high performance run time systems. Cache-memory background and familiarity with compiler optimization, code generation and software validation highly desirable.

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Design of interactive data base, file system and utilities for the development of major operating system components. Will be interfacing with other developers in the design of other executive components.

Networks and Communication

Assessing and defining present and future requirements for distributed processing applications. Should be able to define network concepts as they relate to IBM compatible products (2780/3780, 3270, X.25, HASP) as well as coordinating in-house protocol and emulation development.

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EOE/MF

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Walt Disney Productions, located in Burbank, is seeking several qualified Programmer/Analysts to join their Systems Development staff.

This is a career opportunity to become involved with a wide range of business applications including interactive program development in an online virtual memory environment.

Qualified applicants should possess 2 - 5 years experience in the design and programming of business applications using COBOL as the primary language. College degree preferred but not required.

Experienced candidates interested in this opportunity should submit resume with salary requirements to:

WALT DISNEY PRODUCTIONS
Professional Staffing — **HS364C**
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Burbank, CA 91521

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Scientific Programmer/Analyst

Tucson, Arizona

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GSU

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SYSTEMS SOFTWARE ANALYST

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For details on the above or NUMEROUS additional FINANCIAL, INSURANCE, MANUFACTURING, or GENERAL BUSINESS EDP opportunities contact either office, in strictest confidence, for complete coverage on all. All costs paid by our Client companies.

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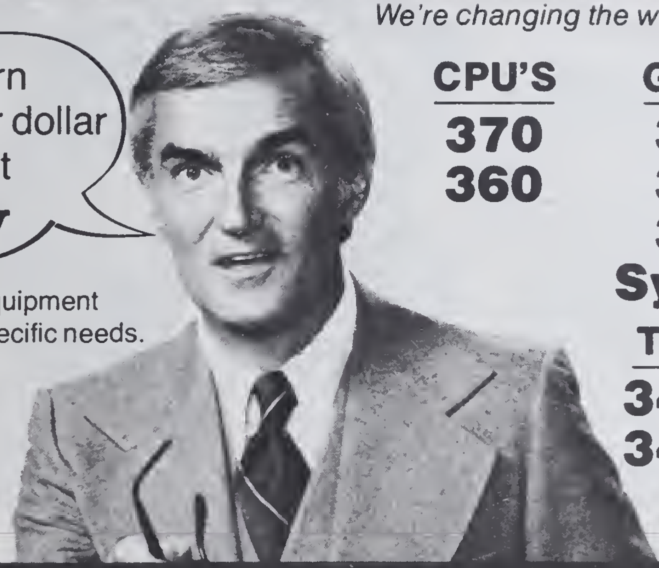

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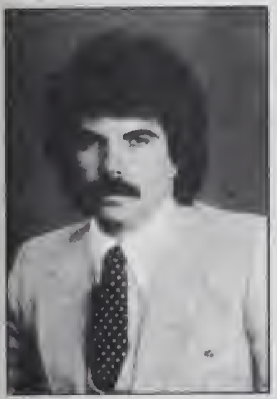

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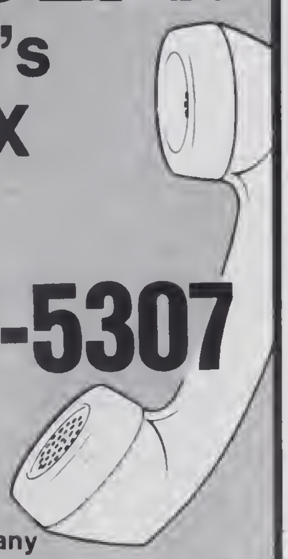

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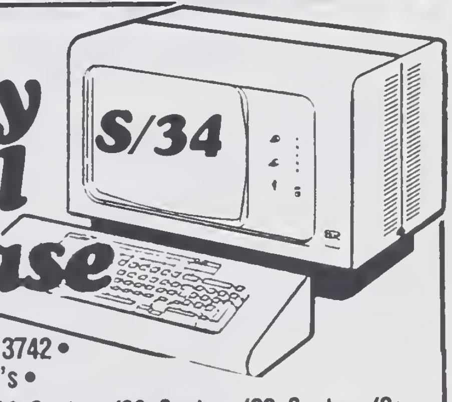

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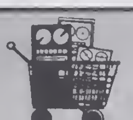

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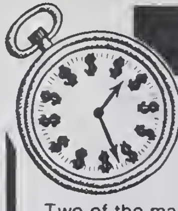

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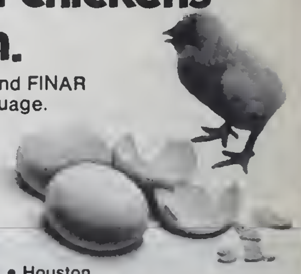

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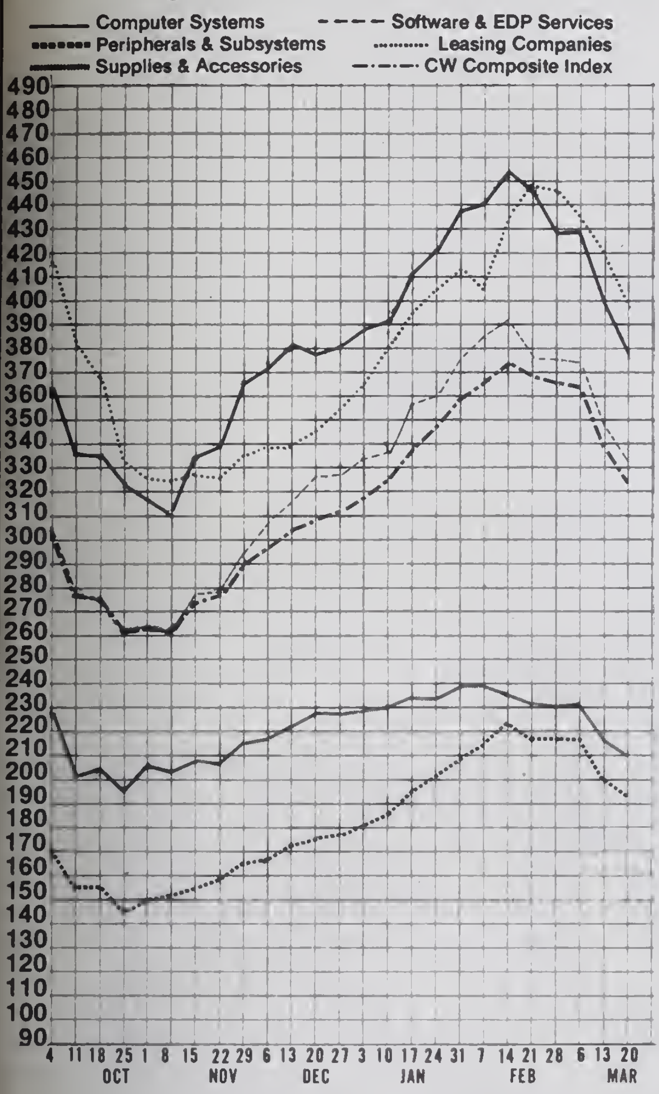

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TRADE°QUOTES

Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, MARCH 19, 1980

All statistics compiled, computed and formatted by
TRADE QUOTES, INC.
Cambridge, Mass. 02139

COMPUTER SYSTEMS

EXCH		PRICE 1979-80 RANGE (1)	CLOSE MAR 19 1980	WEEK NET CHNGE	WEEK PCT CHNGE
A	AMDAHL CORP	17- 69	20 7/8	-2 3/4	-11.6
N	BURROUGHS CORP	59- 87	64 3/8	-4 5/8	-6.7
D	COMPUTER AUTOMATION	9- 44	17 3/4	- 1/4	-1.3
N	CONTROL DATA CORP	23- 61	48 5/8	+ 1/2	+1.0
D	CRAY RESEARCH INC	8- 58	44 1/2	-1 1/2	-3.2
N	DATA GENERAL CORP	42- 74	61 1/4	-3 5/8	-5.5
N	DATAPOINT CORP	34-123	104 1/8	-8 1/8	-7.2
N	DIGITAL EQUIPMENT	39- 80	63	-7 1/8	-10.1
N	ELECTRONIC ASSOC.	2- 13	8	- 3/4	-8.5
A	ELECTRONIC ENGINEER.	9- 19	13 7/8	+ 1/2	+3.7
N	FOUR-PHASE SYSTEMS	19- 47	32 5/8	- 3/8	-1.1
N	FOXBORO	28- 44	33 3/8	-2 3/8	-6.6
O	GENERAL AUTOMATION	7- 26	12 7/8	- 3/4	-5.5
D	GRI COMPUTER CORP	1- 3	5/8	0	0.0
N	HEWLETT-PACKARD CO	24- 70	62 7/8	- 1/8	-0.1
N	HONEYWELL INC	43-100	81 3/4	-5 1/4	-6.0
N	IBM	59-321	58 7/8	-2 1/2	-4.0
N	MANAGEMENT ASSIST	9- 29	13 3/4	-3 7/8	-21.9
O	MANUFACTURING DATA S	9- 38	27 3/4	-1 3/4	-5.9
D	MINI-COMPUTER SYST	2- 8	3 1/8	- 1/4	-7.4
D	MODULAR COMPUTER SYS	7- 18	11 7/8	-1 7/8	-13.6
N	NCR	37- 81	67 5/8	-6 1/4	-8.4
N	PRIME COMPUTER INC	9- 32	28 5/8	- 3/8	-1.2
N	PERKIN-ELMER	17- 47	39 3/8	- 5/8	-1.5
N	SPERRY RAND	33- 60	49 7/8	-1 5/8	-3.1
A	SYSTEMS ENG. LABS	11- 24	16 1/2	-1 5/8	-8.9
O	TANDEM COMPUTERS INC	13- 54	42 1/2	-2 1/2	-5.5
N	TEXAS INSTRUMENTS	78-108	86	-5	-5.4
A	WANG LABS.	6- 40	34 5/8	-1 1/2	-4.1

LEASING COMPANIES

EXCH		PRICE 1979-80 RANGE (1)	CLOSE MAR 19 1980	WEEK NET CHNGE	WEEK PCT CHNGE
D	BOOTHE FINANCIAL CP	13- 21	16 1/4	- 1/2	-2.9
D	COMDISCO INC	3- 21	10	- 7/8	-8.0
A	COMMERCE GROUP CORP	1- 2	1 3/4	- 1/2	-22.2
A	COMPUTER INVSTRS GRP	1- 7	2 1/4	- 1/8	-5.2
D	CONTINENTAL INFO SYS	3- 15	2 1/2	- 1/2	-16.6
M	DATRONIC RENTAL	1- 4	2 5/8	0	0.0
A	OCL INC	3- 6	5 1/4	- 1/8	-2.3
N	DPF INC	6- 14	6 1/4	- 1/4	-3.8
N	ITEL	3- 36	3 1/8	- 1/2	-13.7
N	LEASCO CORP	24- 73	61 5/8	+1 5/8	+2.7
O	LEASPAC CORP	1- 4	1/9	0	0.0
A	PIONEER TEX CORP	2- 7	2 7/8	+ 1/8	+4.5
N	U.S. LEASING	12- 20	12 3/4	- 1/8	-0.9

SOFTWARE & EDP SERVICES

EXCH		PRICE 1979-80 RANGE (1)	CLOSE MAR 19 1980	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 2	1 1/2	0	0.0
O	ANACOMP INC	8- 24	13 3/4	- 3/4	-5.1
O	ANALYSTS INTL CORP	3- 6	4 3/4	- 1/2	-9.5
A	APPLIED DATA RES.	8- 17	9 3/4	- 3/8	-3.7
N	AUTOMATIC DATA PROC	24- 40	34	+1 1/4	+3.8
D	COMPU-SERV NETWORK	5- 19	18 1/8	- 1/8	-0.6
D	COMPUTER HORIZONS	1- 9	3 3/4	- 1/4	-6.2
O	COMPUTER NETWORK	5- 16	4 7/8	- 1/2	-9.3
N	COMPUTER SCIENCES	8- 24	18 7/8	0	0.0
D	COMPUTER TASK GROUP	1- 9	7 1/4	- 1/4	-3.3
O	COMPUTER USAGE	2- 5	2 7/8	- 1/2	-14.8
O	COMPUT AUTO REP SVC	4- 10	5	0	0.0
O	COMSHARE	6- 26	15 1/2	-1 1/2	-8.8
O	CULLINANE CORP	14- 34	31	-2	-6.0
D	DATA DIMENSIONS INC	1- 9	1 1/2	- 1/8	-7.6
O	DATATAB	1- 4	7/8	- 1/4	-22.2
O	DSI CORP	4- 9	6 1/2	- 1/2	-7.1
N	ELECTRONIC DATA SYST	15- 28	20 5/8	-1 5/8	-7.3
O	INFORMATICS INC	9- 22	14 3/4	- 3/4	-4.8
D	INSYTE CORP	1- 3	1 3/8	0	0.0
D	IPS COMPUTER MARKET.	2- 3	3 1/2	0	0.0
D	KEANE ASSOCIATES	3- 9	8 1/2	0	0.0
D	KEYDATA CORP	1- 5	2 1/2	- 1/4	-9.0
A	LOGICON	10- 23	17 7/8	- 1/8	-0.6
O	NATIONAL DATA CORP	7- 19	16 1/4	-1 3/4	-9.7
N	PLANNING RESEARCH	4- 10	6 1/2	- 1/2	-7.1
O	PROGRAMMED TAX SYSTS	3- 5	4 3/4	0	0.0
O	PROGRAMMING & SYS	1- 1	3/4	0	0.0
O	RAPIDATA INC	3- 7	5	0	0.0
D	REYNOLDS & REYNOLD	18- 36	27 3/4	- 3/4	-2.6
D	SCIENTIFIC COMPUTERS	3- 16	11 1/2	0	0.0
N	TYMSHARE INC	18- 58	47 1/2	-1 3/4	-3.5
A	URS SYSTEMS	5- 12	9 3/4	- 7/8	-8.2
N	WYLY CORP	1- 9	7 7/8	- 3/4	-8.6

PERIPHERALS & SUBSYSTEMS

EXCH		PRICE 1979-80 RANGE (1)	CLOSE MAR 19 1980	WEEK NET CHNGE	WEEK PCT CHNGE
N	AM INTERNATIONAL	13- 32	18 3/4	+1 1/4	+7.1
N	AMPEX CORP	10- 29	24 7/8	+ 1/2	+2.0
A	ANDERSON JACOBSON	5- 16	11 3/4	0	0.0
N	APPLIED DIG DATA SYS	6- 22	7 1/8	+ 1/8	+1.7
O	AUTO-TROL TECHNOLOGY	14- 39	31 3/4	+ 1/4	+0.7
O	BEEHIVE INT'L	3- 8	6	+ 1/2	+9.0
A	BOLT.BERANEK & NEW	6- 22	16 5/8	-1 3/8	-7.6
N	BUNKER-RAMO	10- 32	24 1/2	-1 1/4	-4.8
O	CAMBRIDGE MEMORIES	1- 9	1 3/4	- 1/8	-6.6
O	COMPUTER DEVICES INC	5- 9	6 1/4	- 1/4	-3.8
N	CENTRONICS DATA COMP	16- 54	36 3/8	-5 3/8	-12.8
O	COGNITRONICS	1- 4	2 5/8	0	0.0
O	COMPUTER COMMUN.	6- 10	4 1/4	- 7/8	-17.0
O	COMPUTER CONSOLES	4- 29	24	-1 3/4	-6.7
A	COMPUTER EQUIPMENT	3- 7	6 1/4	+ 1/2	+8.6
O	COMPUTER TRANSCEIVER	1- 5	2 1/2	- 1/8	-4.7
O	COMPUTERVISION CORP	5- 58	49 3/4	- 1/2	-0.9
N	CONRAC CORP	13- 26	18 5/8	- 5/8	-3.2
A	DATA ACCESS SYSTEMS	0- 14	10 1/4	-1 1/2	-12.7
A	DATA PRODUCTS CORP	13- 25	16 1/4	-1 5/8	-9.0
O	DATUM INC	2- 6	2 1/2	- 1/4	-9.0
O	DECISION DATA COMPUT	2- 6	2 1/4	0	0.0
O	DELTA DATA SYSTEMS	1- 3	2 1/2	+ 5/8	+33.3
N	DOCUMATION INC	6- 34	11 1/2	-1 1/8	-8.9
O	DATARAM CORP	6- 36	27 1/2	- 1/2	-1.7
N	ELECTRONIC M & M	3- 9	4 5/8	- 1/8	-2.6
O	EVANS & SUTHERLAND	20- 52	50	-1	-1.9
O	FABRI-TEK	1- 2	1 7/8	- 1/4	-11.7
O	GENERAL COMPUTER SYS	1- 3	2 1/4	- 1/8	-5.2
O	GENERAL DATACOMM IND	9- 24	14 1/4	-1 1/2	-9.5
N	HAZELTINE CORP	10- 29	23 1/4	- 1/8	-0.5
N	HARRIS CORP	17- 39	31 7/8	- 5/8	-1.9
D	INFOREX INC	1- 11	1 1/4	- 1/8	-9.0
D	INFORMATION INTL INC	7- 15	11 1/4	+ 1/2	+4.6
O	INFOTON	1- 4	2 5/8	+ 1/8	+5.0
O	INTEL CORP	26- 75	63 1/2	-3 3/4	-5.5
D	INTERSIL	7- 32	23	0	0.0
A	LUNDY ELECTRONICS	4- 11	8	- 1/2	-5.8
O	MSI DATA CORP	6- 19	6 5/8	- 5/8	-8.6
N	MEMOREX	14- 59	13 5/8	- 3/8	-2.6
N	MOHAWK DATA SCI	6- 20	15 1/4	-1 1/4	-7.5
O	OMEX	2- 10	10	0	0.0
D	PARADYNE CORP	9- 36	30 5/8	- 1/8	-0.4
A	PENRIL CORP	5- 15	10 5/8	- 1/4	-2.2
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	RAMTEK CORP	7- 17	14 3/4	0	0.0
D	RECOGNITION EQUIP	5- 13	6 3/4	- 5/8	-8.4
O	SCAN DATA	1- 5	1 3/4	- 1/4	-12.5
N	STORAGE TECHNOLOGY	14- 46	14 7/8	-2 3/4	-15.6
O	SYKES DATATRONICS	4- 31	16 1/4	-2 3/4	-14.4
O	T BAR INC	11- 28	23	-3 1/4	-12.3
A	TEC INC	4- 13	4 3/8	- 1/8	-2.7
N	TEKTRONIX INC	33- 64	46 7/8	-3 5/8	-7.1
N	TELEX	3- 9	3 1/4	- 3/8	-10.3
D	TESDATA SYSTEMS CP	8- 26	12 3/8	- 1/8	-1.0
O	TIMEPLEX INC	4- 14	10 3/8	-1 3/8	-11.7
O	WILTEK INC	1- 2	1 1/4	0	0.0

SUPPLIES & ACCESSORIES

EXCH		PRICE 1979-80 RANGE (1)	CLOSE MAR 19 1980	WEEK NET CHNGE	WEEK PCT CHNGE
A	AMERICAN BUS PRODS	6- 12	9 1/2	- 1/4	-2.5
O	BALTIMORE BUS FORMS	1- 4	1	0	0.0
N	BARRY WRIGHT	14- 34	21 3/4	-1 1/2	-6.4
O	CYBERMATICS INC	1- 1	7/8	- 1/8	-12.5
O	DUPLEX PRODUCTS INC	13- 31	23 3/8	- 1/2	-2.0
N	ENNIS BUS. FORMS	5- 21	14 3/8	- 3/4	-4.9
N	3M COMPANY	43- 66	48 1/8	+ 3/8	+0.7
O	MOORE CORP LTD	26- 34	28 1/2	- 1/4	-0.8
N	NASHUA CORP	18- 37	22	-1 1/8	-4.8
O	STANDARD REGISTER	20- 29	24	-2	-7.6
A	TAB PRODUCTS CO	8- 22	19 1/4	+1	+5.4
A	WABASH MAGNETICS	10- 22	13	- 3/8	-2.8
N	WALLACE BUS FORMS	18- 33	25	-1 1/8	-4.3

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